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GUPTA (R. M.) & PRICE (W. C.). **Mechanism of inhibition of plant virus infection by fungal growth products.**—*Phytopathology*, 42, 1, pp. 45–51, 2 graphs, 1952.

At the University of Pittsburgh, Pennsylvania, the authors investigated the mechanism of the action of the substance present in *Trichothecium roseum* in the reduction of infection by the southern bean mosaic, tobacco mosaic, and tobacco necrosis viruses [*R.A.M.*, 30, p. 98]. Evidence is adduced from five lines of approach to the problem in support of the hypothesis that the antagonistic effects of the fungal substance on the viruses are caused by an alteration in host susceptibility. The first was concerned with the nature of the quantitative change in activity of solutions in which the concentration of the inhibitor or the virus, or both, was varied. Secondly, partial separation of the virus and inhibitor was effected by high-speed centrifugation. Thirdly, the longer the duration (up to 80 minutes) of contact between the inhibitor and a leaf, the more extensive was the inhibition. Fourthly, the inhibitory substance was almost as efficient in the prevention of infection on the upper leaf surface when applied to the under side as when the upper surface itself was treated. In conclusion, the inhibitory activity of the products secreted by *Guignardia bidwellii* and *Lambertella pruni*, as well as of *T. roseum*, was found to vary with the host.

HEINZE (K.). **Virusübertragungsversuche mit Blattläusen auf Dahlien, Gurken, Zwiebeln, Wasserrüben und einigen anderen Pflanzen.** [Virus transmission experiments with aphids on Dahlias, Cucumbers, Onions, Turnips, and some other plants.]—*Z. PflKrankh.*, 59, 1–2, pp. 3–13, 5 figs., 1952. [English summary.]

From the standpoint of phytopathological importance the aphid vectors of virus diseases may be divided into the categories of 'occasional' and 'normal', the former having no close connexion with the plant to which they transmit infection, while the latter regularly colonize the virus hosts. Continuing his studies at the Virus Research Institute, Berlin-Dahlem, on the capacity of various aphids to transmit particular viruses [*R.A.M.*, 29, p. 636; 31, p. 168], the author demonstrated the transmission of *Dahlia* mosaic virus [ibid., 31, p. 121] to *Dahlia* by *Brachycaudus helichrysi* [*Anuraphis padi*], *Pergandeida cytisorum*, *Myzus ornatus*, *Rhopalomyzus ascalonicus*, *Myzodes* [*Myzus*] *ligustri*, and *Cryptomyzus ribis*; cucumber mosaic to cucumber by *Rhopalosiphum nymphaeae*, *Doralina mordwilkiana*, *M. ligustri*, and *Delphiniobium junackianum*, and to *Calendula* by *Pharalis tanaceti*; onion yellow dwarf [ibid., 16, p. 724; 31, p. 99] to onion by *Rhopalomyzus ascalonicus*, *Neomyzus* [*M.*] *circumflexus*, *Dysaulacorthum pseudosolani* [*Macrosiphum solani*], and *D. vincae*; turnip mosaic [ibid., 29, p. 450] to turnip by *Rhopalosiphum nymphaeae*, *Doralina transiens*, *C. ribis*, and *Acyrthosiphum onobrychis* [*Macrosiphum pisum*], and to turnip and kohlrabi by *Rhopalomyzus ascalonicus* and *N. circumflexus*; potato leaf roll [ibid., 31, p. 348] to *Physalis floridana* by *R. ascalonicus*; bean

yellow mosaic [ibid., 30, p. 91], which developed in bean (*Phaseolus vulgaris*) plots in the experimental field, to bean by *Pergandeida craccae*; stock mosaic (apparently identical with cauliflower mosaic virus) [ibid., 29, p. 449; 30, p. 569] to cauliflower by *Macrosiphum onobrychis*; a poppy mosaic occurring annually at Dahlem to poppy by *Doralis* [*Aphis*] *fabae* and *Myzus persicae*; and a net mosaic of uncertain origin on *Delphinium* to *Delphinium* by *Delphiniobium junackianum*.

Annual Report of the Director, Experimental Farms Service, 1950–1951.—26 pp., 10 figs., 1 map, Department of Agriculture, Ottawa, Canada, 1952.

On p. 24 of this report [cf. *R.A.M.*, 30, p. 507] it is stated that the newly developed Burley tobacco, Briarvet, was released by the Harrow Station for commercial production in 1950. It shows fairly high resistance to brown root rot [loc. cit.] and is highly resistant to black root rot [*Thielaviopsis basicola*: ibid., 31, p. 259].

MAJID (S.). **Annual Report of the grow more food activities of the Department of Agriculture, Assam, for the year 1950–51. Part II.**—iii+116 pp., 1952.

In the section of this report [cf. *R.A.M.*, 30, p. 262] dealing with plant protection work in Assam in 1950–51 (pp. 46–51) it is stated that during the period under review an epiphytotic of potato blight (*Phytophthora infestans*) [loc. cit.] occurred in parts of the plains, causing losses ranging from 10 to 65 per cent. Spraying with Bordeaux mixture (4–4–50), perenox (3 lb. per 100 gals.), dithane Z78 (1½ lb. per 100 gals.), and dithane D14 (2 qt.+1 lb. zinc sulphate per 100 gals.) increased yields by 20 to 54 maunds [1 maund = 37·327 kg.] per acre. Plants sprayed with the last-named remained greener for a much longer period and survived much longer than those given the other treatments; they also gave the highest increase in yield. Spraying with perenox (4 oz.) and 3 oz. DDT (guesarol-550) per 10 gals. water effectively controlled *Cercospora cruenta*, *Colletotrichum lindemuthianum* [ibid., 30, p. 263], and caterpillar (*Prodenia litura* and *Diacrisia obliqua*) infestation on mugma (*Phaseolus radiatus*) and matima (*P. mungo*). Spraying with combined perenox and DDT and improved cultural practices in orange orchards with wither-tip (*Colletotrichum gloeosporioides*) [*Glomerella cingulata*: cf. ibid., 26, p. 485] increased yields by 25 to 50 per cent. and improved the tone and vigour of the trees.

Primera Asamblea Latinoamericana de Fitoparasitología. [First Latin-American Congress of Phytopathology.]—*Foll. misc. Ofic. Estud. esp. Méx.* 4, 426 pp., 7 pl., 3 figs., 6 diags., 7 graphs, 3 maps, 1951.

The following were among the papers presented at the First Latin-American Congress of Phytopathology, held in Mexico City, from 25th September to 6th October, 1950. J. CERVANTES and A. RODRÍGUEZ (pp. 34–39) report the discovery of an efficient new cicada vector, *Dalbulus elimatus*, of the maize stunt virus [*R.A.M.*, 31, p. 318]. It is more widespread and abundant in Mexico than *D. maidis* and transmitted 100 per cent. infection after an incubation period of 26 to 30 days.

In studies by A. RODRÍGUEZ and J. CERVANTES (pp. 39–41) on the influence of the date of inoculation on the symptoms of maize stunt, six transmissions with *D. elimatus* were effected between 2nd May and 17th July. The earlier the infection was established, the greater were the average reductions in height, which were on 15th August from 2·15 (control) to 1·05 and from 2·29 (control) to 1·25 mm. for inoculations on 2nd and 16th May, respectively. Thereafter stunting gradually decreased until the last transmission in mid-July, which resulted in no subsequent difference in height between the inoculated and control plants.

G. MURILLO PERALTA (pp. 52–57) reports on the initiation of work on the selection of maize for resistance to *Fusarium moniliforme* [*Gibberella fujikuroi*: ibid., 30, p. 153], *G. zeae*, *Diplodia zeae*, and *Nigrospora oryzae*, with special reference to

the first-named, which is responsible for substantial reductions in the quality and quantity of the crop through rotting of the ears.

Experiments were conducted by A. Sánchez Potes (pp. 57–61) at Chapingo, Mexico, to determine the relative efficiency of sulphur and fermate in the control of *Puccinia sorghi* on maize [loc. cit.] and of *P. graminis* and *P. triticina* on wheat. Fermate gave excellent results in all the tests, while sulphur was reasonably effective against the wheat rusts [ibid., 30, pp. 149, 514] but quite inadequate against *P. sorghi*.

The wheat rusts (*P. graminis*, *P. glumarum*, and *P. rubigo-vera tritici* [*P. triticina*]) were found by J. Orjuela N[avarette] (pp. 61–70) to be the principal diseases of the crop in Colombia and probably co-extensive with its cultivation. *P. glumarum* is the most destructive and widespread besides being the earliest to appear—at or often before node formation. Next in importance is *P. graminis*, while *P. triticina* is the least injurious. Two physiologic races of *P. graminis* have been identified (by Dr. E. C. Stakman) as occurring in Colombia and northern Ecuador, namely, Nos. 15 [ibid., 30, pp. 220, 513] and 48 [ibid., 25, p. 30]. Field and greenhouse studies have disclosed the following valuable sources of resistance to (1) *P. glumarum*: Ardito, Blé tendre 1315, Florestana 181, Frocor 2346–46, Hope × Thatcher II–32–2, Kenya × Mentana II selection, Einkorn, and Chinese 166; (2) *P. graminis*: Apex, Ceres × Pilot C.I. 12017, Chapingo, Defiance, Frocor 2375–46, Heana (or Heaha) A–924, Kenya Governor, Kenya 321–36, Kenya 324, Kentana, (Marroqui × Newthatch) Newthatch [, and] (Mentana × Kenya) Mentana; to (3) *P. triticina*: Bagé, Frocor 2328–46, Frondoso C.I. 12078, Frontana, Henry C.I. 12265, Klein Aniversario, Mentana (beardless), Mentana × Rocamex 211, (Mentana × Kenya) Mentana, Mida 2689, Newthatch, Peru × Rocamex 211, Pieve, Rionegro, Einkorn C.I. 2433, Webster C.I. 3780, Mediterranean C.I. 3332, and Loros C.I. 3779, and (4) to a combination of the three rusts: Ceres × Komar Hussar, C.I. 12040–2882–S'48, Frocor 2375–46, Frontana-Brasil '49, Hope × Thatcher II–32–2, (Mentana × Kenya) × Mentana CR.II 469–13c–1c–1c, Mentana × Rocamex 211–II–291–1c–1c (2–6c), Peru × Rocamex 211–II–328–1c (1–3c), and Newthatch × Mentana II 133–8c–2c–2c.

A. Campos (pp. 70–81) isolated from samples of wheat collected in Mexico during 1949 the physiologic races of *P. graminis* [ibid., 31, p. 110] 1, 17, 19, 38, 49, 56, and 59, with 17, 38, and 59 predominating [see below, p. 377]. Of 120 selections tested in the seedling stage for their reactions to races 11, 15B [ibid., 31, p. 234 and below, p. 377], 17, 38, and 56, 20 were resistant to all five; Kenya was represented in the pedigree of at least 19. Rocamex 211 [ibid., 28, p. 623] and Yaqui 48 [ibid., 31, p. 110] proved moderately susceptible to the five races at a temperature range of 60° to 85° F. The responses of Rocamex 324 and Kentana 48 [loc. cit.] varied with the prevailing temperature, being susceptible at 80° to 85° but very resistant at 60° to 65°. It is necessary, therefore, to subject new varieties descended from Kenya to rigorous tests at high temperatures before their release for cultivation in moist, warm climates.

A tabulated account is given (pp. 81–83) of experiments by L. Robles to determine the reactions to *P. triticina* [loc. cit.] and the productivity of a number of early and late wheat varieties cultivated in the Monterrey region of Mexico. Best suited to local conditions in the former group are Gabo (resistant), Chapingo 48 (susceptible), and (Mentana × Kenya) Mentana (resistant), which yielded, respectively, 2,306, 1,633, and 1,526 kg. per ha.; and in the latter Timstein × Aguilera and (Peru × Supremo) Peru (both resistant), producing 1,513 and 1,367 kg. per ha., respectively. Resistant but lower-yielding representatives of the early group included Mayo 48, Kenya × Mentana, and Supremo 211, and of the late, Egypt × Timstein, (Kenya × Marroqui) Marroqui, and Supremo × Kenya.

B. Ortega Cantero (pp. 83–88) discusses the principles and practice of cleansing, selection, and disinfection of wheat seed-grain for disease and pest control in

Mexico. The agents of root rot are species of *Rhizoctonia*, *Fusarium*, *Alternaria*, and *Helminthosporium*.

Of 49 malting barley varieties and selections tested by L. Robles (pp. 89–90) in November, 1949, for their reactions to *Erysiphe graminis* [cf. below, p. 378] and *Helminthosporium gramineum* in the Monterrey district of Mexico, the very unproductive Bolivia was the only one showing a high degree of resistance to the former pathogen, and Oderbrucker 38 to the latter. Moderate resistance to *E. graminis* was shown by Bulk 26, Bulk 28, and native selections 76–4, 76–6, 76–7, 77–20, and 93–23, and to *H. gramineum* by Bulk 18, O.A.C. 21, Wisconsin 38, and Peatland.

In seed treatment experiments by Lucy Hastings (pp. 90–99) for the control of *Helminthosporium oryzae* [*Ophiobolus miyabeanus*] on rice in Costa Rica [ibid., 29, p. 431], granosan (½ oz. per 44 lb.) was the only disinfectant effective against seedling blight in the greenhouse. Applied four months before planting, it produced a 75 per cent. increase in the stand. In the field, too (where trials are still in progress), granosan (1¼ oz. per cwt.) gave the best stand (819 average) in a test at Turrialba and arasan in one at El Pelon.

The experimental studies of Lucy Hastings (pp. 99–107) on the pathogens of rice in Costa Rica, briefly reported elsewhere [loc. cit.] showed that stands in soil inoculated with *O. miyabeanus* and *Piricularia oryzae* or with *Curvularia spicifera* [ibid., 19, pp. 258, 601] were reduced to less than 25 per cent., while *Sclerotium oryzae* [ibid., 28, pp. 29, 239] lowered production to less than 50 per cent.

A. Sánchez Potes (pp. 107–109) investigated relationships between the rusts attacking certain kinds of pasture grasses and *P. graminis* on wheat, *P. coronata* on oats, and *P. hordei* on barley in central Mexico, where the active growth of the hosts all the year round permits the continuous reproduction of the rusts in the uredial phase. In cross-inoculation experiments *P. coronata* attacked *Dactylis glomerata* and a collection from *Bromus laciniatus* was pathogenic to *D. glomerata* and oats. *P. graminis* and *P. hordei* were innocuous to these grasses.

The bean [*Phaseolus vulgaris*] varieties used in preliminary inoculation experiments by María de los A. Meléndez (p. 118) with the alpha, beta, and gamma races of *Colletotrichum lindemuthianum* [ibid., 3, p. 110] in connexion with the Mexican plant breeding programme [ibid., 29, p. 244] showed a high degree of susceptibility to alpha but were very resistant to beta and gamma. Local collections were of the alpha race. Infection developed only at a temperature range of 18° to 25° C. and in a very humid atmosphere. Anthracnose is disseminated principally by means of contaminated seeds.

Spraying experiments against blight (*Phytophthora infestans*) on tomatoes were conducted by M. Ríos (pp. 154–157) in Mexico in 1949, using dithane, crag [cf. ibid., 30, p. 437], microgel [cf. ibid., 30, p. 542], and an alternating schedule of zerlate and copper A [cf. ibid., 29, p. 292], all with the addition of DDT. The 13 treatments were applied weekly from 30th June, and an outbreak of the disease occurred during the first fortnight of September. At the final count in October, the highest percentage of sound fruits was produced by the plots sprayed with microgel (70·06), followed by crag (44·1), dithane (27·41), zerlate-copper A (19·12), and untreated (5·7).

F. Mujica (pp. 158–162) describes investigations on the possibilities of combating *Sclerotinia sclerotiorum* [ibid., 31, pp. 242, 250], the principal if not the only pathogen of sunflowers in Chile, where the plant is widely grown for oil production [cf. ibid., 29, p. 467]. Since its appearance in the country a few years ago, the fungus has acquired progressively increasing importance and at present causes losses amounting to 5 per cent. of the crop. The exclusive use of seed certified by the Ministry of Agriculture is recommended. Crop rotation with cereals and other Gramineae should be practised to eliminate the fungus from the soil, allowing at least four years to elapse between one sunflower stand and the next. In seed

disinfection tests absolute protection was conferred by ceresan and meracet [loc. cit.], both of which are available in Chile, at 1 in 500.

In seed disinfection experiments by J. Martínez (pp. 162–165) in Mexico, no improvement in maize germination was effected by treatment with arasan, spergon, semesan jr., dow 9B, or maizan rey for the control of soil pathogens, e.g., *Fusarium*, *Pythium*, *Corticium*, and *Botrytis* spp. For radish, cabbage, onion, turnip, and chicory, the best results were obtained with semesan jr., whereas mercuric chloride (1 in 1,000) was more efficacious against damping-off in carrots. Granosan at a dosage of 55 gm. per 100 kg. seed entirely eliminated *Sphacelotheca sorghi* from the seed of five highly susceptible sorghum varieties [ibid., 31, p. 181], arasan at 500 gm. per 100 kg. being slightly less efficient.

Trials have been carried out by J. Olivas (pp. 165–167) at the Chapingo Experiment Station, Mexico, in the control of potato blight (*Phytophthora infestans*) by spraying with various fungicides. In 1948, when the first outbreaks developed on 3rd August, the yields obtained from the plots treated with COCS [copper oxychloride sulphate: ibid., 30, p. 26], copper A, and Bordeaux mixture were 11·1, 10, and 8·5 tons per ha., respectively, compared with 2·5 for the controls, using DDT. The disease was absent in 1949 and in 1950 it appeared too late to form a basis for comparison with 1948. It may reasonably be concluded, however, that *P. infestans* is amenable to control by fungicidal treatments, of which Bordeaux mixture is the most economical. An unusual feature of infection in Mexico is the initial development of the lesions on the nodes, later extending to the stem. *Alternaria solani* was also present.

All apple varieties cultivated in Chile were found by C. Vergara Castillo (pp. 224–232) in his important study on *Nectria galligena* [ibid., 5, p. 747; 21, p. 443; 29, p. 262] to be more or less susceptible to canker, which also occurs in a milder form on pear and has further been detected on a new host, *Sorbus aucuparia*. Among the more resistant apple varieties are Winesap, Jonathan, Gravensteiner, Northern Spy, Rome Beauty, Red Astrakhan, Delicious, and Stayman Winesap. There are two strains of the fungus in the country, distinguishable by their conidial states [cf. ibid., 7, p. 676]. Strain A produces a yellow to cream-coloured stroma, uni-, bi-, or triseptate macroconidia, measuring 29·5 by 5·13, 36·1 by 5, and 37·8 by 4·9 μ, respectively, and microconidia 2·7 to 6 by 2·6 to 3 μ. The stroma of strain B is lemon-yellow, the tri-, quadri-, or quinqueseptate macroconidia average 55·8 by 5·07, 57·1 by 5·18, and 59·4 by 5·18 μ, respectively, and the microconidia 4 to 8 by 2·5 to 4 μ. Both strains gave rise to round or slightly oval, flame-coloured, later chestnut-red perithecia, 300 to 430 by 270 to 380 μ. The asci measure 80 to 110 by 7 to 13 μ and the ascospores 12 to 20 by 5 to 8 μ. Six inoculation tests were performed in March, 1949, on a Delicious apple tree, two each with pure cultures of strains A and B and two with perithecia. By the following October, cankers had developed on one each of the sites inoculated with A and B and on both those infected by perithecia. The latter are formed mostly from June to August on the debris of pruned branches. Three-year-old perithecia have been successfully used in inoculation experiments, while stromata of the same age have produced abundant colonies on potato dextrose agar. Among the numerous factors, including faulty cultural practices, contributing to the prevalence of *N. galligena* in southern Chile may be mentioned the superficial cankers caused by *Myxosporium corticola* [*Pezicula crataegi*: ibid., 29, p. 536], which facilitate the entry of the former pathogen. In addition to rational cultural methods, including the destruction of lichens by a dormant application of lime-sulphur, prophylactic treatments with 2 per cent. Bordeaux mixture in the autumn and 1 per cent. in the spring are recommended to reduce the stromatal and perithecial population of the orchard, while cankers on the trunks and branches should be excised and the wounds disinfected with 2 per cent. copper sulphate and covered with Bordeaux paste or white paint. The

final solution of the control problem, however, lies in the development of resistant varieties of a type approximating to the commercially valuable but susceptible Yellow Newtown, and nurseries have been established for this purpose in three localities.

In laboratory studies by F. L. Wellman and T. R. Quesada (pp. 246–251) at Turrialba, Costa Rica, the spores of *Cercospora coffeicola*, the agent of coffee leaf spot [ibid., 30, pp. 194, 196], germinated only in the presence of water. Germination was equally profuse in light and darkness and extended over a pH range from 3 to 8, with an optimum at 4 to 5. The pH values of sap from young and mature leaf tissues were 5·1 to 5·3 and 5·7, respectively. Particulars are given of tests to determine the comparative incidence of infection on shaded leaves and those exposed to the sun, from which it was evident that shade imparts a form of resistance to the disease (an average of 0·1 spots in heavy shade compared with 1·2 spots in full sun) which requires closer investigation. Indications of differences in varietal reaction to *C. coffeicola* were also observed, Arabigo being more resistant than Borbon, while Hybrido proved to be very susceptible in both Costa Rica and El Salvador. Leaf spot was more prevalent in trees of 25 years and upwards than in younger ones.

F. L. Wellman, J. C. Walker, A. Cook, and M. Gallegly (pp. 251–257) report on the results of studies under controlled conditions on the temperature relations of five important pathogens of coffee in Costa Rica, namely, *Pellicularia* [*Corticium*] *koleroga* [ibid., 30, pp. 248, 367], *Cercospora coffeicola*, *Fusarium oxysporum* f.? [cf. ibid., 29, p. 617], *Omphalia flavida* [*Mycena citricolor*: ibid., 31, p. 183], and *Colletotrichum coffeanum* [*Glomerella cingulata*: ibid., 29, p. 259]. The optimum for *Corticium koleroga* on potato dextrose agar was 28° C., with good growth at 24° and 32° and virtual inhibition at 8° and 36°. *F. oxysporum* f.? grew well at 16° to 32°, with a marked optimum at 28°, and a minimum and maximum at 8° and 36°, respectively. The range for satisfactory growth of *M. citricolor* was rather narrow, extending from 16° to between 24° (the optimum) and 28°, but development started a degree or two above 8° and continued until the maximum at 32°. *G. cingulata* is most prevalent in the warmer areas of El Salvador, Guatemala, Colombia, and Costa Rica. In these studies it began to grow at or slightly above 8°, developed well at 20°, attained a peak at 28°, and ceased just above 32°. The minimum temperature for *Cercospora coffeicola* was 8°, growth was good at 12°, vigorous at 20° to over 28°, and development continued even at 32° but was inhibited at 36°.

There are a number of serious objections to the use of Bordeaux mixture (such as the difficulty of obtaining the materials required, and the poor keeping qualities of the mixture) for the control of *Phytophthora palmivora* on cacao in Costa Rica [ibid., 30, p. 219], and 11 fungicides were therefore tested by L. Rey Siller and J. H. McLaughlin (pp. 257–261) on potential substitutes. Seven days after inoculation with the fungus, the plants previously sprayed with phygon were entirely free from leaf and stem lesions, while those treated with SR 406 [cf. ibid., 31, p. 54] bore only 2·4 per cent., as compared with 3·3 for the standard 5–5–50 Bordeaux. However, at the 14- and 21-day counts the percentages for phygon and SR 406 had risen, indicating poor adhesiveness.

J. H. McLaughlin (pp. 262–267) contributes important additional information on the symptomatology of *P. palmivora* on cacao in Costa Rica under the headings of pod rot, shoot blight and canker, precocious maturity, leaf blight, 'cherelle' (young fruit) wilt [ibid., 22, p. 293], and seedling wilt. Investigations are also in progress to determine the connexion of the same fungus and *Pythium* spp. with a very destructive root rot of cacao.

E. P. Imle, W. E. Manis, and E. Camacho (pp. 267–273) propose the adoption in Costa Rica and elsewhere in tropical America of a new system of *Hevea* rubber cultivation involving modifications in nursery practice directed towards the control

of diseases, especially South American leaf blight (*Dothidella ulei*) [ibid., 23, p. 455]. A tree should consist of three inter-grafted components, namely, (1) a root derived from a seedling, (2) a trunk producing heavy yields of latex, and (3) resistant branches and foliage. This method was used for the first time in the Ford Company's plantations in Brazil [ibid., 26, p. 334]. In this connexion it is pointed out that all high-yielding clones so far tested are susceptible to *D. ulei*; and that none of the resistant ones at present available are productive.

S. C. Arruda's experiments (pp. 273–282) have shown that the virulence of leaf scald (*Bacterium* [*Xanthomonas*] *albilineans*) in São Paulo, Brazil [ibid., 24, p. 431], is such as to preclude the cultivation of sugar-cane varieties of a degree of susceptibility approximating to that of C.P. 29/320 or Co. 281. Reductions in yield are due principally to a low percentage of germinability and the inability of the diseased plants to withstand the predominating local winter droughts.

According to S. Flores Cáceres (pp. 302–324), the most important diseases of sugar-cane in Mexico are the mosaic virus, which has spread over most of the country during the last 20 years [ibid., 9, p. 342], and red rot (*Colletotrichum falcatum*) [*Physalospora tucumanensis*], though root rot (*Pythium arrhenomanes*) and wilt (*Cephalosporium sacchari*) [ibid., 30, p. 510] are responsible for occasional losses over a limited area. Of minor significance are *Gibberella fujikuroi*, *Cercospora vaginae* [C.M.I. map No. 251], *Leptosphaeria sacchari*, *Corticium rolfsii*, *Cercospora longipes*, and *Cytospora sacchari*. No control measures are practised and mosaic-infected 'seed' is used for new stands, which are very often interplanted with maize, thereby facilitating the transmission of the virus by *Aphis maidis*. All the Javanese varieties except P.O.J. 36 are immune from or resistant to mosaic, but the Co. 213, Co. 281, and Co. 290, which have largely contributed to the progress of the Mexican sugar industry, are liable to heavy infection and serious losses from this source must be anticipated.

C. Casas-Campillo (pp. 335–342) reports the isolation in 1949 from Smooth Cayenne pineapples from Oaxaca and Veracruz of *Thielaviopsis* [*Ceratostomella*] *paradoxa* [C.M.I. map No. 142], this being the first record of the pathogen for Mexico. The perfect state did not develop during the year covered by the investigation.

W. H. Tisdale (pp. 392–401) emphasizes the value of the co-operation of industry with Government and endowed institutions in an organized research programme for the development of insecticides, fungicides, and herbicides. Methods of investigation and assay are described, information on toxicology and equipment for the application of sprays and dusts is presented, and some outstanding achievements of recent years are briefly indicated.

A. S. Muller (pp. 402–406), in connexion with a scheme for the establishment and maintenance of a mycological herbarium in Honduras as a basis for the compilation of a list of indigenous plant diseases and the publication of a phytopathological survey of the country, emphasizes the value of such projects and the need for co-operation between the various Latin-American countries in their execution.

Heim (R.), Fusey (P.), & Locquin (M.). **Propriétés fongistatiques d'une bactérie aérobie sporulée.** [Fungistatic properties of an aerobic sporulating bacterium.]—*C. R. Acad. Sci., Paris*, 228, 25, pp. 1899–1902, 1949.

A bacterium arising as an accidental contaminant in Sabouraud's agar cultures exerted a clear-cut to specially powerful fungistatic action on *Fusarium argillaceum*, *F. arthrosporioides*, *F. avenaceum*, *F. bulbigenum* (mostly isolated from oil palms suffering from 'boyomi' disease in the Belgian Congo [*R.A.M.*, 30, p. 318]), *F. decemcellulare*, *F. javanicum*, *F. oxysporum* and its var. *cubense*, *F. semitectum* var. *majus*, *F. solani* var. *martii*, *F. vasinfectum*, *Thielaviopsis* [*Ceratostomella*] *paradoxa*, *Coriolus* [*Polystictus*] *versicolor*, *Gyrophana* [*Merulius*] *lacrymans*, and a number of other species.

The bacterium is probably a member of the *Bacillus brevis* group, but it differs from the type in various particulars, including its spore measurements (1·3 to 1·6 by 0·7 to 0·8 as against 1·8 to 2·2 by 0·9 to 1·2 μ) and the acidification of glucose and sucrose.

McEwen (Doris M.). **Cancerous response in plants.**—*Nature, Lond.*, 169, 4307, p. 839, 1952.

In crown gall [*Bacterium tumefaciens*: *R.A.M.*, 31, p. 276] studies at the Department of Botany, University of Western Ontario, Canada, bacteria-free tissue from primary galls on sunflower [cf. ibid., 22, p. 241; 26, p. 238] was cultured on White's media and implanted in healthy stem segments from sunflower seedlings. After removal of the implants two to seven weeks later the host stocks subsequently developed necrosis earlier than controls with normal tissue implants and did not proliferate further. Where the implants died about two days after grafting the host stock displayed a limited stimulatory response and a delayed necrosis comparable with that of control stems and stems treated with low concentrations of growth hormones [cf. ibid., 26, p. 289]. However, 5 per cent. of the stems bearing dead implants developed a tumorous swelling which arose from the apical tissue of the host two weeks after implanting. These swellings rapidly formed into large tumours with the cream colour and nodular growth habit of bacteria-free crown gall tumour tissue. This response is explained on a basis of the auxin supplied by the tumour implant.

D'Oliveira (B.). **The centers of origin of cereals and the study of their rusts.**—*Agron. lusit.*, 13, 3, pp. 221–226, 1951. [Portuguese summary.]

In this paper, read before the Fifth International Congress of Microbiology, Rio de Janeiro, 1950, the author summarizes the results of field observations and inoculation experiments [*R.A.M.*, 20, p. 353] to determine the function of the aecidial state of certain cereal rusts in Portugal, which is situated on the western verge of the centres of origin of wheat, barley, rye, and oats, and may therefore be regarded as suitable for a study of this description.

The aecidial state of *Puccinia hordei*, prevalent on barley throughout the country [ibid., 29, p. 151], has been found in nature only on *Ornithogalum narbonense*, *O. umbellatum*, and *O. unifolium* near stocks of barley stubble. Of 35 *O.* spp. inoculated, 26 proved to be susceptible, all endemic in Europe, the Near East, or North Africa. On the other hand, nine South African species, including *O. caudatum* and *O. graminifolium*, were quasi- or wholly immune. Tests on other Liliaceae revealed *Dipcadi serotinum* as a new host of *P. hordei*.

Most of the aecidia collected from October to January on *Thalictrum speciosissimum* near old wheat fields were found to belong to *P. rubigo-vera tritici* [*P. triticina*: ibid., 24, p. 280]. Potted plants of *T. speciosissimum*, placed in fields of wheat stubble during the same period, contracted heavy rust infection. Of 46 *T.* spp. inoculated with teleutospores of *P. triticina*, 36 were more or less congenial to the rust, the most susceptible [loc. cit.], all of European or Asiatic origin, including *T. speciosissimum*, *T. glaucum*, *T. delavayi*, *T. calabricum*, *T. foetidum*, and *T. dipterocarpum*. Several American species, on the contrary, were highly resistant or immune. *Isopyrum fumarioides*, which has been designated the most important aecidial host of bearded wheat in its Siberian habitat, also reacted negatively to all the Portuguese races of *P. triticina* tested, while *I. thalictroides* developed only slight infection.

Eight groups of physiologic races of *P. triticina secalis* [*P. dispersa*] with aecidia on *Anchusa*, *Cynoglossum*, *Echium*, *Lycopsis*, *Nonnea*, and *Omphalodes* were differentiated on the basis of host specialization in the uredo stage, some attacking only one grass genus, others more than one, e.g., *Aegilops* and wheat, *Aegilops* and

rye, wheat and rye, or wheat, rye, and *A. ovata*, while one race, collected on *Anchusa italica*, did not attack any of the grasses tested. Clear-cut specialization in the races from wheat, rye, and *Aegilops* was further demonstrated by inoculation experiments with teleutospores of each, the first infecting only a few plants of *Anchusa italica*, the second several species of *Anchusa* and *Echium*, as well as *O. nitida*, and the third species of *Echinum*, *Cynoglossum*, and *A. sempervirens*.

It is evident from these results that the range of aecidial hosts of these rusts is wider than previously described and includes genera not yet recorded. Congeniality was found to exist only when the alternate hosts emanated from the same centre of origin. Under Portuguese conditions the aecidial state of these rusts is of real significance as a source of primary infective material and as a means of breeding new physiologic races through hybridization and segregation.

The centres of origin of the rust hosts should be thoroughly surveyed and investigated on a basis of international collaboration. Only in this way can a judgment be formed as to the local importance of the aecidial phase of a given rust, the host range and specialization of both its different states, and the trend of development of each biological group represented by the host-parasite complex in a specific phytogeographical area.

De Urries (M. J.). **Razas fisiológicas de Puccinia graminis tritici en España.** [Physiologic races of *Puccinia graminis tritici* in Spain.]—[*Publ.*] *Cons. sup. Invest. cient., Madr.*, 56 pp., 10 pl., 2 graphs, 1 diag., 1 map, 1951.

This is a fully tabulated survey and discussion of the results of inoculation experiments at the Botanic Garden, Madrid, on the 12 differential wheat varieties used by Stakman and collaborators in the United States [*R.A.M.*, 24, p. 272] with 149 isolates representing physiologic races 10, 14, 16, 17, 21, 24, 32, 34, 40, 75, 122, 133, and 186 of *Puccinia graminis*, collected in various provinces of Spain [ibid., 31, p. 276] from 1947 to 1949. Little Club was susceptible to all the 13 races. Marquis was resistant to 10, 14, 16, and 186; Reliance to 14, 16, 17, 21, 24, 75, 133, and 186; Kota to 10, 14, 16, 24, 75, 122, 133, and 186; Arnautka, Mindum, and Spelmar to 133 and 186; Einkorn to 16, 21, 34, 40, 75, 133, and 186; Vernal to all except 40; and Khapli to all. The reactions of Arnautka, Mindum, Spelmar, Kubanka, and Acme to race 32 were heterogeneous.

The population of race 14 far exceeded that of any of the others. It was widely distributed in a number of provinces and also occurred in the Balearic and Canary Islands collections. Next in order of prevalence came 17, 133, 21, 24, and 16. There were only four collections of race 40, the most virulent of all the Spanish races, from Cadiz and Murcia. Races 14, 24, and 40 are also present in Portugal [ibid., 20, p. 455]; of the Spanish races Germany harbours 14, 17, 21, 24, 34, 40, and 133 [ibid., 18, p. 730; 31, p. 233]; Poland 14, 17, 21, 24, and 40 [ibid., 18, p. 662]; Italy 17 and 40 [ibid., 16, p. 89; 25, p. 551]; and Bulgaria 17, 24, 34, and 40 [ibid., 27, p. 376]. Outside Europe, race 34 is found in Australia [ibid., 15, p. 635]; 34 and 21 in South Africa [ibid., 15, p. 6]; 14, 17, and 21 in Egypt (according to a written communication dated April, 1950, from the office of UNESCO in Cairo); 21, 24, 40, and 75 in India [ibid., 20, p. 292]; 10, 34, and 40 in China [ibid., 25, p. 157]; 14 in Peru [ibid., 25, p. 62] and Chile; 17 in Argentina [see next abstract], Uruguay, and Chile, and 21 in Uruguay [ibid., 23, p. 255; 28, p. 57]. Most of the Spanish races have been recorded from Canada [ibid., 25, p. 355] and the United States [ibid., 25, p. 62].

Vallega (J.). **Consideraciones sobre la raza 15 B de Puccinia graminis tritici.** [Considerations on race 15B of *Puccinia graminis tritici*.]—*Idia* (*Inform. Direcc. Invest. agríc., B. Aires*), 4, 45, pp. 14–17, 1951.

In September, 1950, more than 800 wheat samples of diverse origin were sent by Dr. H. A. Rodenhiser of the United States Department of Agriculture to the

Phytotechnical Institute, Castelar, Argentina, for testing in the field against the local population of black rust (*Puccinia graminis*), about half of which was found to be constituted by races 15 and 17 [*R.A.M.*, 28, p. 166; 31, p. 277; and preceding abstract]. Race 15 B [see above, p. 371] and others were used in greenhouse inoculation experiments on the comparatively few samples emerging from the outdoor trials with a sufficient degree of resistance to warrant further testing under conditions more propitious to infection.

The most dependable sources of resistance disclosed by the investigations were Kenya 58 (C.I.12471), Kenya 117A (C.I.12568), Egypt NA101 (C.I.12100), some lines of Egypt N95 (C.I.12894), many of the hybrids with these varieties in their ancestry, Kenya Governor, and Kenya Standard. The most resistant of the durum varieties were Baladi 116 and different types of Tremez. Further trials on over 1,000 wheats from the United States were planned for 1951.

FISCHER (G. W.). **Tilletia brevifaciens sp. nov., causing dwarf bunt of Wheat and certain grasses.**—*Res. Stud. St. Coll. Wash.*, 20, 1, pp. 11–14, 1 pl., 1952.

A description is given of *Tilletia brevifaciens* n.sp., responsible for dwarf bunt, short smut, stunt bunt, or stubble smut of wheat and *Agropyron intermedium*, previously included under the binomial *Tilletia caries* [*R.A.M.*, 31, p. 178] and treated as an anomalous race of that fungus. The sterile cells are few, sometimes encased in a very hyaline gelatinous sheath 2 to 4 μ thick, and are 10 to 16 μ in diameter (excluding sheath); the globose or subglobose, yellowish brown to light greyish brown spores are 17 to 22 μ in diameter, the exospore being adorned with large polygonal reticulations mostly 3 to 5 μ wide and 1·5 to 2·5 μ deep. Each spore is usually encased in a hyaline, almost imperceptible, gelatinous sheath, 1·5 to 4 μ thick. It differs from *T. caries* in that spore germination is induced with difficulty and differs somewhat from that of ordinary bunt; soil infestation is the normal source of infection, which rarely results from seed-borne spores; the spore balls are generally hard and compact; and the infected plants are markedly dwarfed and excessively tillered. All collections of dwarf bunt, including the original one reported from Montana [ibid., 14, p. 350] and German ones [see next abstract], proved identical with the Pacific Northwest collections under discussion. Oil immersion examination of each of the 16 physiologic races of *T. caries* did not reveal the presence of a sheath enveloping the spores or sterile cells, and in all the races the reticulation lacked the depth and regularity characteristic of *T. brevifaciens*.

PICHLER (F.). **Zwergsteinbrand auch in Österreich!** [Dwarf bunt in Austria too!]—*Pflanzenarzt, Wien*, 4, 11, pp. 4–5, 1 fig., 1951.

Dwarf bunt of wheat [*Tilletia caries*, but see preceding abstract], which has become prevalent in Bavaria [*R.A.M.*, 28, p. 388; 31, p. 278] since its detection there (for the first time in Europe) in 1942, was observed during 1951 in Upper Austria, Styria, and Carinthia. Well-known cultural practices for the prophylaxis of the disease are briefly recapitulated, and treatment is recommended as a precaution against the possibility of seed transmission.

RUDORF (W.) & WIENHUES (F.). **Die Züchtung mehltau-resistenter Gersten mit Hilfe einer resistenten Wildform (Hordeum spontaneum nigrum H 204).** [The breeding of mildew-resistant Barleys with the aid of a resistant wild form (*Hordeum spontaneum nigrum* H 204).]—*Z. PflZücht.*, 30, 3, pp. 445–463, 3 figs., 1951.

Of paramount importance in relation to the breeding of barley for resistance to mildew (*Erysiphe graminis*) [cf. above, p. 372] are the development of new biotypes and the distribution of the fungus [cf. *R.A.M.*, 31, p. 279]. In Germany the control of the disease is complicated by the lack of varieties with comprehensive group

resistance to the known physiologic races [ibid., 31, p. 324]. This is the best safeguard against the risks inherent in the production of new mildew biotypes and in the cultivation of semi-resistant varieties, which are susceptible to races of initially restricted distribution. *Hordeum spontaneum nigrum* H 204, which has been used since 1934 as a parent in crosses with commercial varieties, is resistant to all the nine recognized races except F. At the Müncheberg Plant Breeding Station, and of recent years at Voldagsen, two back-crosses were generally found necessary to achieve the requisite combination of resistance with outstanding productivity, seed quality, and so forth. In some lines of winter barley, proceeding from two back-crosses of resistant summer selections with winter varieties, resistance to mildew was united with heavy yields, hardiness, and precocity.

Goto (S.) & Moore (M. B.). **Some Oat diseases in Minnesota 1951.**—*Plant Dis. Reptr*, 36, 2, p. 69, 1952. [Multilithed.]

Victoria blight (*Helminthosporium victoriae*) [*R.A.M.*, 31, p. 235], inconspicuous for several years in Minnesota, is reported to have been very severe on Vicland oats in 1951. Also on oats downy mildew (*Sclerospora macrospora*) [ibid., 29, p. 152] was detected for the first time at St. Paul.

Poole (D. D.) & Murphy (H. C.). **Reaction of Oat varieties to black stem and to a toxic substance produced by the causal organism.**—Abs. in *Phytopathology*, 42, 1, p. 16, 1952.

The common name of 'black stem' is proposed for a disease of oats originally designated 'speckled blotch' by G. F. Weber in 1922 and caused by *Leptosphaeria avenaria* [*R.A.M.*, 2, p. 159; cf. ibid., 27, p. 230]. The most important black stem phase of the disease is characterized by greyish-brown to shiny black lesions on the upper internodes, especially below the leaf sheath, which result in severe culm-breaking with the approach of maturity in many varieties. In the uniform oat nurseries planted throughout Iowa in 1951 Andrew, Marion, Kent, Cherokee, Nemaha, Mindo, Barton, Colo, Zephyr, and Bonham were the most susceptible to black stem, while Richland, Mo.0–200, Clinton, Shelby, Bonda, Mo.0–205, Branch, Ajax, and Beaver were moderately resistant to resistant. Most of these resistant and susceptible varieties being of similar parentage, resistance to *L. avenaria* is probably governed by multiple gene action. Cultures of the pathogen produce a typical brown pigment on a number of dextrose-containing media, an extract of which, sprayed on the leaves or injected into the internodes of oat plants, induces characteristic leaf blotch and black stem symptoms.

Baldacci (E.) & Forlani (R.). **Ricerche sulla specializzazione della Claviceps purpurea.** [Studies on specialization in *Claviceps purpurea*.]—*Phytopath. Z.*, 17, 1, pp. 81–84, 1950. [English and German summaries.]

In further studies on *Claviceps purpurea* [cf. *R.A.M.*, 28, p. 448], inoculations into various Gramineae, made at the Plant Pathology Institute, Milan University, confirmed the existence of the race p5, the only one occurring in Italy [ibid., 29, p. 567], which differs from other races [ibid., 25, p. 64] in infecting rye and *Lolium* spp. but not *Bromus erectus*.

Roman (H.) & Ullstrup (A. J.). **The use of A-B translocations to locate genes in Maize.**—*Agron. J.*, 43, 9, pp. 450–454, 2 figs., 2 diags., 1951.

This joint contribution from the Department of Botany, University of Washington, the Division of Cereal Crops and Diseases, United States Department of Agriculture, and the Department of Botany and Plant Pathology, Purdue University Agricultural Experiment Station, Lafayette, Indiana, describes the application

to the *Hm hm* alleles, concerned with the reaction of maize to infection by *Helminthosporium carbonum* U. 11 race 1 [*R.A.M.*, 26, p. 448], of the A-B translocation method, utilizing functional deficient gametes to place genes within specific chromosomal segments in a single generation. By this means the locus was shown to reside in the distal seven-eighths of the long arm of chromosome 1, about 22 recombination units from the centromere.

A list is given of the available A-B translocations and their respective points of breakage.

VAHEEDUDDIN (S.). **Two new physiologic races of Sphacelotheca sorghi.**—*Indian Phytopath.*, 3, 2, pp. 162–164, 1951.

Three collections of *Sphacelotheca sorghi* from Raichur, Gulbarga, and Aurangabad counties of Hyderabad State, India, were mixed with sorghum seeds of differential host varieties imported from the United States and the seeds sown at Government Main Agricultural Experimental Station, Himayatsagar, Hyderabad, in 1941–2 and 1942–3. In the two years host reactions were almost identical. Some collections were classified into two new physiologic forms, 7 (Shrock highly susceptible) and 8 (Shrock resistant). The key previously prepared by the writer for identifying six physiologic forms of the fungus [*R.A.M.*, 24, p. 14] is now amended to include the new ones.

MALAGUTI (G.). **Epifitias de 'tizón' en plantas cítricas causadas por Phytophthora parasitica.** [Epiphytotics of 'blight' in Citrus plants caused by *Phytophthora parasitica*.]—*Agron. trop., Maracay*, 1, 3, pp. 213–226, 3 figs., 1951. [English summary.]

Phytophthora parasitica, the common agent of citrus foot rot and gummosis [*R.A.M.*, 31, p. 343] in Venezuela, is here recorded for the first time as the cause of a top wilt of sour orange seedlings [cf. ibid., 31, p. 236] and a foliar wilt and stem rot of the scions of nursery grafts of sweet orange, mandarin, grapefruit, and lemon. First observed during the rainy season in August, 1950, the disease recurred in December of the same year and again in February, 1951, on heavy, ill-drained soils in dry weather following abnormally heavy precipitation. Inoculation tests with *P. parasitica* on 12-year-old Marsh grapefruit, Criolla and California orange, and French lemon trees resulted in the development of foot rot. The fungus also caused a fruit rot of Meyer and Villafranca lemons, California and Valencia oranges, and tomato, and a stem rot of potato [ibid., 18, p. 742; 21, p. 1] and *Vinca rosea*.

The disease was effectively combated in the seed-bed and nursery by spraying with copper A compound, Shell copper, or dithane. In February, 1951, orange seeds were sown in soil treated with 2 per cent. copper sulphate at a dosage of 5 l. per sq. m. following heavy infestation by *P. parasitica*. A month after germination 35 per cent. of the seedlings were dead compared with 100 per cent. in the unsterilized seed-beds and those treated with other fungicides.

ROSSETTI (VICTORIA) & BITANCOURT (A. A.). **Estudos sôbre a 'gomose de Phytophthora' dos Citrus. II. Influência do estado de vegetação do hospedeiro nas lesões experimentais.** [Studies on '*Phytophthora* gummosis' of Citrus. II. Influence of the state of growth of the host on experimental lesions.]—*Arq. Inst. biol. S. Paulo*, 20, 7, pp. 73–94, 4 pl., 3 graphs, 1951. [English summary.]

An examination of the results of an inoculation experiment on sweet orange trees with *Phytophthora citrophthora* [see next abstract] reported in the first paper of this series from the Biological Institute, São Paulo, Brazil [*R.A.M.*, 28, p. 213], showed that trees with young shoots bore larger lesions than those at the end of a growth cycle or passing from one cycle to another. In a further test in which 52

two-year-old potted seedlings of the same species were divided into four groups of 13, according to the stage of development of the new flush of growth, the lesions produced on those with very young shoots (the leaves still folded) were larger than in the groups with well-developed shoots or no young growth.

In another experiment four five-year-old seedlings each of the Coronel (susceptible), Hamlin and Lisa Paulista (intermediate), and Natal (resistant) sweet orange varieties were inoculated at four sites 23, 30, 40, and 79 days after complete removal of the leaves. In general, the size of the lesions increased *pari passu* with shoot development, but the dry weather following the operation on the third group apparently retarded the progress of infection, resulting in smaller lesions than those in the second. In a further trial, conducted under uniform meteorological conditions, four six-year-old seedlings of each of the Abacaxi (susceptible), Hamlin, Lisa Paulista, and Pera (resistant) varieties were inoculated after pruning on four successive dates. The size of the lesions on Hamlin and Abacaxi increased with that of the shoots, but in Lisa Paulista and Pera there was no correlation between the stage of development of the shoots and the progress of infection. The lesions attain their maximum size when the leaves are fully grown, and the crown entirely rehabilitated.

The effect of removing the leaves on half of the tree was studied on five-year-old seedlings of the Abacaxi, Coronel, Ouro (intermediate), Lisa Paulista, Natal (resistant), and Pera varieties, eight of each being inoculated a fortnight later on both parts. The lesions were considerably larger on the unpruned than on the pruned side.

It would appear from these results that the size of the lesions of *P. citrophthora* is determined by two factors, the first and most important being the extent of the leaf surface and the second the presence of newly formed shoots. The increased physiological activity prevailing in the tree during the early phase of shoot growth presumably favours the development of the fungus and renders the host more susceptible.

Rossetti (Victoria) & Bitancourt (A. A.). **Thiamin and the growth substances for Phytophthora in the bark of Citrus trees.**—*Science*, 115, 2982, pp. 205–206, 1 graph, 1952.

The authors have shown in auxanographic experiments (*Rev. bras. Biol.*, 9, p. 525, 1949) that thiamin does not affect the radial growth of thalli of *Phytophthora* spp. but rather the ramification of the hyphae, thus increasing the thickness of the mycelial mat. The authors have postulated a hypothetical factor *L*, present in several natural media, to account for the radial growth. In an experiment in the Department of Plant Pathology, Biological Institute, São Paulo, Brazil, disks of citrus bark tissue were placed on water or Czapek's agar in Petri dishes. After four hours the disks were removed and the sites inoculated with *Phytophthora*. The thalli growing over the site of sweet orange bark, susceptible to gummosis due to *Phytophthora* spp. [see preceding and next abstracts], were slightly but significantly larger than those over sour orange, a highly resistant species.

The effect of both factor *L* and thiamin was determined by placing bark disks from five sweet orange trees and five sour ones on large plates of Czapek's agar for four hours, each dish containing one disk of each group and one of filter paper containing 0·4 μgm. thiamin. The sites were then inoculated with *P. citrophthora*. The thalli at both bark sites were significantly larger than those at the thiamin site or the controls. The thickness of the mycelial mat was greatest for the thiamin disks and was substantially greater for the sweet orange than for sour.

Lesions on trees affected by gummosis show a characteristic zoning in the inner bark, each zone corresponding to a period of 24 hours. This may be due to changes in the amount of growth substances in the bark during this period.

Speroni (H. A.). **El afrancamiento de las plantas cítricas enfermas de 'tristeza'.** [The self-rooting of Citrus plants with 'tristeza' disease.]—*Idia* (*Inform. Direcc. Invest. agríc., B.Aires*), 4, 45, pp. 18–20, 5 figs., 1951.

The self-rooting [or soil-banking] method of combating citrus gummosis or foot rot [*Phytophthora* spp.: cf. preceding and next abstracts] in Florida, designed to stimulate the formation of adventitious roots [*R.A.M.*, 21, p. 486], has been successfully adapted in Argentina to the control of 'tristeza' root rot [ibid., 31, p. 343 and next abstract]. Directions are given for its application and the necessary after-care.

Knorr (L. C.), Ducharme (E. P.), & Banfi (A.). **La exocortis en los montes cítricos de la Argentina.** [Exocortis in the Citrus groves of Argentina.]—*Idia* (*Inform. Direcc. Invest. agríc., B.Aires*), 4, 45, pp. 8–12, 1 fig., 1951.

The trifoliate orange (*Poncirus trifoliata*), resistant to tristeza root rot [see preceding abstract], is susceptible to exocortis [*R.A.M.*, 28, p. 520] in Entre Ríos and the north-eastern provinces of Argentina, where information elicited from growers indicates that the disease has been present since early in 1930. Visits to seven estates in Entre Ríos where the trifoliate orange was used a stock revealed the following situation in respect of exocortis among the scions: (1) 6,000 three-year-old Lue Gim Gong oranges had been eradicated; (2) 5 to 8 per cent. of 3,000 of the same species (same age) affected; (3) 2 per cent. of 3,000 lemons of unknown age affected; (4) all 7,000 five-year-old Valencia oranges eradicated; (5) all 3,000 six-year-old Lue Gim Gong eradicated; (6) 1,500 12-year-old trees of the same variety to be eradicated; (7) 30 per cent. of 400 14-year-old Nagami kumquats affected.

The external symptoms of trees suffering from exocortis in Argentina are similar to those described by Benton *et al.* from Australia under the name of 'scaly butt' [ibid., 29, p. 506], while the minute cavities in the wood underlying the desquamated cortex are suggestive of stem-pitting [ibid., 31, p. 182]. The authors agree with the Australian workers that the disease is probably caused by a virus, which is propagated only with great difficulty and never under field conditions. Control may be effected by the use of healthy budding material upwards of ten years old (by which time there is no further risk of the development of infections) and careful selection of trifoliate orange stocks, discarding variants with a tendency to produce stunted forms.

Costa (A. S.), Arruda (L. F.), Roessing (C.), & Toledo (I. D.). **Superbrotamento ou envassouramento da Laranjeira.** [Superbudding or witches' broom of Orange.]—*Bragantia, S. Paulo*, 10, 5, pp. 149–150, 1 pl., 1950. [English summary.]

In 1949 a few orange plants suffering from a form of witches' broom [cf. *R.A.M.*, 21, p. 443] were observed in a nursery at Araras, São Paulo, Brazil, and later some 30 per cent. of the 1,500 five-year-old plants of the graft combination Pera on Caipira in an orange grove at Limeira were found to be similarly affected. The anomaly appears to be associated with the use of budwood from witches' broom trees, and transmission experiments are in progress to determine whether it is of genetic or virus origin.

Stubbs (L. L.). **Virus diseases of Citrus in Victoria. 1. A virus disease of Mandarin on Rough Lemon (Citrus limon (Linn.) Burmann) rootstock.**—*J. Dep. Agric. Vict.*, 50, 3, pp. 124–128, 8 figs., 1952.

A description is given of a virus disease of Ellendale mandarin trees on rough lemon stocks in the Mildura area, Victoria [*R.A.M.*, 31, p. 281]. Young seedling-

stock combinations inarch-grafted soon after emergence were tested for transmission of the disease by patch grafting or budding. Symptoms were characteristic and severe on rough sour orange on its own roots three months after grafting. Navel-type sour developed chlorotic foliage only after topping. Rough lemon on its own roots developed no symptoms, but passed the disease to mandarin scions. Further evidence is required to distinguish between the mandarin disease and 'bud-union decline' [loc. cit.].

HEYMANN-HERSCHBERG (LOTTE). **Magnesium deficiency of Shamouti Orange trees and its treatment.**—*Palest. J. Bot.*, R. Ser., 8, 1, pp. 76–83, 1951. [Hebrew summary.]

A chlorotic condition of Shamouti orange trees on light soils in Israel was diagnosed by means of external leaf symptoms and analyses as due to magnesium deficiency [*R.A.M.*, 27, p. 520 *et passim*]. About two-thirds of the leaves on 15-year-old trees in an experimental grove at Rehovot responded to two or four sprays of aqueous solutions of 2 or 4 per cent. magnesium sulphate by a resumption of the normal green coloration. The beneficial effects of the treatment were enhanced by the admixture with the magnesium sulphate solution of 0·5 per cent. iron, zinc, or manganese sulphate, none of which, however, was effective alone.

HANSEN (H. P.). **On the so-called 'unknown disease' and related diseases on Coco-nut-Palms in the West Indies.**—*Plant Dis. Reptr*, 36, 2, pp. 66–67, 1952. [Multilithed.]

Further studies on the unknown disease of coco-nut palms [*R.A.M.*, 30, p. 414], based on detailed observations of symptoms and incidence, transmission tests and other experiments, and historical data and other collected facts, have established that it is not infectious, but due to a toxin, possibly strontium, in certain soils. Similar symptoms were obtained by poisoning the palms with small quantities of related substances. Spread of the disease may be accounted for by the action of sea-spray on soils which contain the toxic elements in absorbed condition. The spread of a similar disease, coco-nut bronze leaf wilt [ibid., 31, p. 14], in the Pomeroon River district, British Guiana, appears to be a consequence of periodic floods from the surrounding savannah swamps.

ABRAÃO (J.). **A 'podridão das raizes' do Cafeeiro.** [The 'root rot' of Coffee.]—*Bol. Serv. Café*, 26, 295, pp. 738–739, 1951.

Essential information (reprinted from *Fôlha de Manhã*, 21st July, 1951) is presented on the root rot of coffee caused by *Rosellinia* spp. in São Paulo, Brazil [cf. *R.A.M.*, 30, p. 96]. The extension of this serious disease during the last six to ten years coincides with an increase in coffee-planting, mostly on virgin soils in which the pathogens flourish. The root rot is also known locally as the 'three-' or 'four-year disease', this being the period required for the fungi to develop on the plant residues in the soil and to reach, attack, and destroy the roots of the coffee trees, which by then are full-grown. A brief description is given of the symptoms of the disease and the propagation of the fungi by means of rhizomorphs [ibid., 10, p. 659], and control measures, based on thorough cleansing of the soil on the lines already indicated.

LEYENDECKER (P. J.). **Root rot of Cotton caused by Thielaviopsis basicola discovered in the Upper Rio Grande Valley of Texas.**—*Plant Dis. Reptr*, 36, 2, p. 53, 1952. [Multilithed.]

Thielaviopsis basicola [*R.A.M.*, 26, p. 449] was found on Pima 32 cotton in 1951, in two fields near Canutillo, Texas, this being the second record of the disease in the south western United States [cf. ibid., 19, p. 14].

Boyce (J. S.). **Cucurbitaria pithyophila, an entomogenous fungus.**—*Plant Dis. Reptr*, 36, 2, pp. 62–63, 1952. [Multilithed.]

In this paper from Yale University, Connecticut, it is pointed out that *Cucurbitaria pithyophila* [*R.A.M.*, 29, p. 484], associated with pine, actually develops on a scale insect infesting pines, the exact relationship between the insect and the fungus being unknown. *C. pithyophila* has been reported on *Pinus flexilis* from Colorado and Idaho, on *P. monticola* from British Columbia and Washington, and on *P. strobus* in several places in the eastern United States from New York to Georgia. It has not been recorded on *P. lambertiana* or on *P. albicaulis*.

Nickl-Navrdtil (Hilde). **Beobachtungen und Untersuchungen über den Erreger der Flachsbräune (Polyspora lini Lafferty).** [Observations and studies on the agent of Flax browning (*Polyspora lini* Lafferty).]—*Faserforsch. u. Textiltech.*, 2, 11, pp. 453–455, 1951.

Stem browning (*Polyspora lini*) is the most prevalent disease of flax in Czechoslovakia [C.M.I. map No. 88], and an extensive outbreak at the Flax Research Institute, Hermesdorf, near Mährisch-Schönberg caused heavy losses of seed, estimated at 73 and 47 per cent. for plants in the 'yellow-ripe' and fully mature stages, respectively, the corresponding losses for the fibres being 16 and 4 per cent., respectively. An examination of material (mostly local) harvested since 1940 revealed the constant presence of the fungus, which is evidently, therefore, endemic in the area. On farms the flax crop is frequently destroyed in the seedling stage by the attacks of *P. lini*. In pure culture on carrot, potato, and oatmeal agar at pH 4 to 5 the fungus assumed a number of morphological forms, which remained constant over a period of eight months at a temperature of 20° to 22° C.

Diehl (W. W.). **Powdery mildew of Kenaf in Florida.**—*Plant Dis. Reptr*, 36, 2, p. 52, 1952. [Multilithed.]

Leveillula taurica f. *hibisci* [*R.A.M.*, 11, p. 183] is reported on *Hibiscus cannabinus* from Florida.

Chrysanthemums.—*Bull. Minist. Agric. Lond.* 92 (Third edition), 50 pp., 10 pl. (2 col.), 9 figs., 1952.

In the section of this bulletin dealing with diseases of chrysanthemums in Great Britain (pp. 45–47) brief descriptions are given of the symptoms and control of rust (*Puccinia chrysanthemi*) [*R.A.M.*, 31, p. 120], mildew (*Oidium chrysanthemi*) [ibid., 19, p. 133; 23, p. 179], blotch (*Septoria chrysanthemella*) [ibid., 16, p. 366], grey mould (*Botrytis cinerea*) [cf. ibid., 30, p. 321], wilt (*Verticillium dahliae*) [ibid., 19, p. 516], leafy gall [ibid., 15, p. 724] caused by *Corynebacterium fascians* [ibid., 31, p. 229], tomato spotted wilt virus [ibid., 29, p. 198], and mosaic caused by the tomato aspermy virus [ibid., 30, p. 417].

Rust may be prevented by growing the plants under dry and airy conditions, burning infected leaves, propagating healthy stocks, and using resistant varieties. Good control of mildew has been claimed by spraying with a salicylanilide compound [ibid., 11, p. 680], and with colloidal copper sprays plus a white oil emulsion. Blotch is aggravated by excessive nitrogenous manuring and bad ventilation. Affected leaves should be burnt and the plants sprayed with Bordeaux mixture when necessary. Grey mould affects plants damaged by frost or grown under humid conditions.

Sennels (N. J.). **The cultivated species of Freesia.**—64 pp., 31 figs., 1 graph, Copenhagen, J. E. Ohlsens Enke, 1951.

Written primarily for Scandinavian growers, this booklet on all aspects of *Freesia*

growing also appears in Danish and German editions. On pp. 58–61 information is given on diseases and their control. *Heterosporium gracile* [*Didymellina macrospora*], developing yellow, clear, oval or extended spots and stripes which later become darker with dark brown borders and a dark centre, when severe can kill the leaf completely. Spraying with a copper or a sulphur preparation plus a wetting agent and destruction of the affected parts are recommended. *Freesia* mosaic virus [*R.A.M.*, 11, p. 591], first discovered at Abingdon, England, in 1929 is somewhat widespread. It is characterized by small, watersoaked spots on the leaves which later dry up and become white and parchment-like. In severe cases the spots coalesce, forming large diseased areas, killing the leaves completely, while healthy leaves on the same plant remain unaffected. The disease attacks new leaves as they appear, gradually spreading as the plant grows. Rust coloured spots are observed on the corms though it is not known whether these are connected with the virus. When the attack is severe the flowers become deformed, often with striping of the petals, and sometimes do not open. Removal and burning of the affected plants and regular fumigation against *Myzus convolvuli*, the vector of the virus, are the best control measures. Seedlings are disease-free in their first year of growth.

For checking the spread of grey mould (*Botrytis cinerea*) [ibid., 28, p. 160] dusting with brassicol or folosan or spraying with pomasol or shirlan and good cultural conditions are recommended. *Freesia* is reported from Holland as a possible host of hard rot (*Septoria gladioli*). Small, roundish, damp, reddish-brown spots develop on the corms and the infected web later sinks deeper into the corm, becoming a hard mass which hinders further development. Similar brown spots, sometimes purplish, appear on the foliage and can spread, though rarely with fatal results. All affected plants should be destroyed and the soil renewed. Corm rot (*Fusarium bulbigenum* [ibid., 18, p. 508] and *F. moniliforme* [*Gibberella fujikuroi*: ibid., 13, p. 100]) is best controlled by very careful sorting of the corms, renewal of the soil, and suitable crop rotation. To prevent introduction of dry rot (*Sclerotinia gladioli*) [ibid., 27, p. 498], which is very serious on seed plants, into the nursery an extended crop rotation programme is required, and a thorough cleaning of the soil after each clearing of the greenhouse both with corm cultures and seed plants. Freshly steamed soil can only be used if it has been thoroughly washed after treatment, otherwise the plants grow too vigorously.

Brierley (P.). **Evidence on the significance of Cucumber mosaic and Tobacco ringspot viruses in Gladiolus.**—*Plant Dis. Reptr*, 36, 2, pp. 48–50, 1 fig., 1952. [Multilithed.]

By a series of index inoculations from *Gladiolus* to Samsun tobacco, snapdragon (*Antirrhinum majus*), and Top Crop beans (*Phaseolus vulgaris*), cucumber mosaic [*R.A.M.*, 31, p. 319], tobacco ring spot [loc. cit.], and bean yellow mosaic viruses [ibid., 26, p. 275] were all recovered from one plant and seem widespread in several varieties of greenhouse-grown *Gladiolus* in the United States. Various symptoms, including white break, stunt, or white streaking, were expressed by the *Gladiolus* source plants yielding tobacco ring spot virus. Those infected with cucumber mosaic and bean yellow mosaic displayed, respectively, white streaking and mottling though some plants with similar symptoms failed to yield these two viruses.

The occurrence of the three viruses together in the variety High Finance without marked stunting or crippling of the flowers indicates that they have no primary causal relation to the more damaging unidentified viroses of *Gladiolus*.

Torgeson (D. C.). **Observations of Verticillium wilt of Geranium in Oregon.**—*Plant Dis. Reptr*, 36, 2, p. 51, 1952. [Multilithed.]

Verticillium albo-atrum is recorded causing wilt of geranium (*Pelargonium*

hortorum) [*R.A.M.*, 20, p. 117] at Hillsboro, Oregon, in 1950. Isolates of *V. albo-atrum* from raspberry [ibid., 31, p. 337] and peppermint [ibid., 31, p. 351] proved to be pathogenic to geranium, being apparently more virulent than the original isolates.

Beaumont (A.). **Diseases of Pelargoniums.**—*Gdnrs' Chron.*, Ser. 3, 131, 3409, pp. 158–159, 1952.

The commonest diseases of *Pelargonium hortorum* in England are grey mould caused by *Botrytis cinerea* and black leg by *Pythium debaryanum* [*R.A.M.*, 3, p. 455]. The former can be particularly destructive on all parts of plants in the greenhouse if the atmosphere is too close. *P. debaryanum* attacks both cuttings and the roots of mature plants. Crown gall (*Bacterium tumefaciens*) [ibid., 30, p. 217] and leafy gall (*Corynebacterium fascians*) [ibid., 29, p. 563] are also common. Leaf curl [ibid., 12, p. 223; 15, p. 444] is the most serious virus disease.

Singh (R. S.). **Root rot of Guar.**—*Sci. & Cult.*, 17, 3, pp. 131–134, 4 figs., 1951.

A destructive root rot of *Cyamospis psoraloides* [*C. tetragonoloba*], first observed at Kanpur in 1947 and subsequently found to be rife in Uttar Pradesh, India (cf. *Indian J. Agric. Sci.*, 14, pp. 388–391, 1944), was shown to be associated with infections by *Rhizoctonia* [*Corticium*] *solani*, *Fusarium caeruleum* [*R.A.M.*, 24, p. 503], *Sclerotium rolfsii* [ibid., 30, p. 521], and *Neocosmospora vasinfecta* [ibid., 17, p. 146]. In soil inoculation experiments with pure cultures of these fungi from a maize meal-soil medium, *C. solani* killed 80 to 90 per cent. of the seedlings (raised in pots from surface-sterilized seeds) within three weeks. *F. caeruleum* caused wilting in 78 per cent. of the plants from the age of three to four weeks until the close of the tests. *S. rolfsii* proved to be a very weak parasite, inducing only about 6 per cent. infection when used alone, though in combination with *C. solani* it grew profusely on the dead seedlings. *N. vasinfecta* was not directly lethal but caused drooping and flagging in some of the leaves.

Cutler (G. H.). **A new improved strain of little Red Clover.**—*Agron. J.*, 43, 11, pp. 572–573, 3 figs., 1951.

Three superior selections from an Ohio strain, F.C. 15808, of double-cut red clover have been consolidated at the Agricultural Experiment Station, Purdue University, Lafayette, Indiana, into one combining a high level of resistance to northern anthracnose (*Kabatiella caulivora*) [*R.A.M.*, 31, p. 125] and some resistance to mildew [*Erysiphe polygoni*: ibid., 29, p. 460] with a very satisfactory performance in hay, aftermath, and seed production tests.

Halpin (J. E.), Hanson (E. W.), & Dickson (J. G.). **Relative pathogenicity of seven species of Pythium on Red Clover seedlings.**—Abs. in *Phytopathology*, 42, 1, p. 10, 1952.

In replicated greenhouse tests [at the Wisconsin Agricultural Experiment Station] to determine the relative pathogenicity to red clover at 16°, 20°, 24°, and 28° C. of seven species of *Pythium*, seedlings were grown for 15 days in glass tumblers containing a mixture of autoclaved white sand, sterile 1 normal Hoagland solution, a small quantity of agar, and the test fungus. *P. debaryanum* was the most pathogenic species [*R.A.M.*, 30, p. 419], followed by *P. irregulare* [loc. cit.; ibid., 31, p. 5], *P. splendens* [ibid., 30, p. 415], *P. ultimum* [ibid., 30, p. 419], *P. paroecandrum* [ibid., 29, p. 361], and *P. arrhenomanes* [ibid., 30, pp. 193, 564] in the order given. *P. rostratum* [ibid., 29, p. 361] did not attack the seedlings. Common symptoms of infection were pre-emergence killing, post-emergence damping-off, root rot (expressed as cortical necrosis culminating in total destruction of the root system), spotting of the cotyledons and hypocotyls, and stunting. Pathogenicity tended to be more marked at 24° and 28° than at 16° and 20°.

Prasada (R.) & Goswami (T. K.). **Studies on Clover rust, Uromyces trifolii (Hedw. f.) Lev., in India.**—*Indian Phytopathology*, 3, 2, pp. 191–195, 2 figs., 1951.

Studies at the Indian Agricultural Research Institute, New Delhi, showed that the aecidial stage of clover rust (*Uromyces trifolii*) [*R.A.M.*, 7, p. 531; 11, p. 423; 28, p. 336] appears locally in February, the uredo and teleuto stages developing in March and April, respectively. The teleutospores remain viable the whole summer and germinate at 6° to 25° C. after a resting period of seven months; germination is accelerated by longer storage and alternate drying and wetting. Pycnia and aecidia are produced when inoculations with germinating teleutospores are carried out in February and March. As the rust cannot oversummer in the uredo stage, teleutospores are the cause of fresh outbreaks of the rust in nature.

Four new forage crops.—*Seed World*, 70, 3, pp. 36, 38, 40, 3 maps, 1952.

Most of the information given here on two lucerne varieties, Ranger and Buffalo, resistant to bacterial wilt [*Corynebacterium insidiosum*], has already been noticed from other sources [*R.A.M.*, 27, p. 466; 30, p. 217]. Buffalo is apparently best suited to a 300- to 400-mile wide belt across the United States at approximately the same latitude as Kansas. In inoculation experiments with southern anthracnose [*Colletotrichum trifolii*: ibid., 31, p. 125] Kenland red clover was twice as resistant as any other variety and is well adapted to that part of the red clover belt where the disease is prevalent and frequently destructive.

Hasler (A.). **Über die Manganbedürftigkeit einiger Gräserarten.** [On the manganese requirements of some species of grasses.]—*Schweiz. landw. Mh.*, 29, 9, pp. 300–305, 1 fig., 1 graph, 1951.

Cereals, especially oats, suffer acutely from manganese deficiency on marshy soils in the Berne district of Switzerland, and the same condition was suspected in various grasses with brownish tips and discolorations of the leaf blades [cf. *R.A.M.*, 31, p. 188]. In pot experiments some of the 15 species of grasses tested reacted to treatment with 1 gm. manganese sulphate per pot by substantial increases in yield, especially *Alopecurus pratensis* and *Arrhenatherum elatior*. As in previous tests, the manganese content of the treated plants was scarcely affected.

Beran (F.), Böhm (Helene), & Wenzl (H.). **Kurze Anleitung zur Schädlingsbekämpfung im Obstbau. 2. Auflage.** [A brief guide to pest control in fruit cultivation. Second edition.]—66 pp., 32 col. figs., Vienna, Bundesanstalt für Pflanzenschutz, 1951.

This useful booklet, mainly concerned with the control of insect pests of fruit in Austria, also comprises brief notes on the occurrence, recognition, importance, and life-history of several fungus pathogens with clear directions for their control.

Shay (J. R.) & Hough (L. F.). **Evaluation of Apple scab resistance in selections of Malus.**—*Amer. J. Bot.*, 39, 4, pp. 288–297, 12 figs., 1952.

Surveys of the fruit breeding plots at the Illinois Agricultural Experiment Station and the *Malus* planting at Morton Arboretum, Lisle, were made in the early and late summer of 1945, 1946, and 1947 for species resistant to scab (*Venturia inaequalis*) [*R.A.M.*, 31, p. 189] on the leaves and fruit. The plots of the Minnesota Agricultural Experiment Station and the Morden Experiment Station, Manitoba, were examined in August, 1947. Controlled inoculation of seedlings budded with the selected clones were made in the greenhouse at Lafayette, Indiana, during the winters of 1947, 1948, and 1949, by forcing the buds and spraying the young leaves thoroughly with combined conidial suspensions of several

single spore isolates, then covering the frame for 40 to 44 hours with five layers of muslin sprinkled with water, and incubating at 60° to 65° F.

Malus honanensis and *M. toringo* gave no macroscopic evidence of infection. There were ten species and two varieties in class 1 (pin-point spots with no sporulation as early as 2½ days after inoculation). These spots appeared to be caused by the collapse of the leaf epidermal cells underlying the penetration peg. Thirteen individuals in class 2 showed irregular chlorotic or necrotic lesions, while three in class 3 developed a few restricted sporulating lesions. The susceptible Jonathan and Golden Delicious control trees developed extensive, abundantly sporulating lesions. So far there is no evidence of strains of the pathogen that can incite the susceptible reaction on the resistant clones. Single-spore culture inoculations of selected clones suggested variation in the ability of the organism to attack the different host genotypes.

In 1945 and 1946 certain resistant clones and the susceptible varieties Red Rome and Jonathan were field-grown, mostly near a source of inoculum, by co-operators in ten regions where scab is a problem. In each season light to moderately heavy infection occurred on Red Rome by early July while on the more resistant Jonathan infection varied from absent to moderate. At no location did typical sporulating scab lesions occur on any of the resistant *Malus* clones tested. They were all examined *in situ* during the three growing seasons from 1945 to 1947. At no time were scab lesions apparent on either fruit or leaves, although, in many cases, the branches were interlaced with those of susceptible varieties partially defoliated by *V. inaequalis*.

Sharvelle (E. G.) & Vandemark (J. S.). **Volatile chemicals for the inhibition of fruit losses in storage and transit.**—Abs. in *Phytopathology*, 42, 1, p. 19, 1952.

Very encouraging results have been obtained in preliminary experiments on the control of storage and transit rots of perishable fruits in the United States by space fumigation with volatile hydrocarbons. The development of *Rhizopus nigricans* [*R. stolonifer*] in strawberries [*R.A.M.*, 19, p. 26; 28, p. 130] incubated at room temperature for 24 hours after inoculation was totally inhibited by a 24-hour exposure to the vapours of trichloroethylene, tetrachloroethylene, and s-tetrachloroethane at concentrations ranging from 1 part of the chemical to 4,000 parts of air down to 1 in 40,000. At the same range of concentrations these chemicals were equally effective against brown rot (*Monilinia* [*Sclerotinia*] *fructicola*) [see next abstracts] of apple [ibid., 21, p. 337; 22, p. 486] and peach [ibid., 30, p. 618; 31, p. 72]. In laboratory tests the same compounds at the same concentrations were lethal to potato dextrose agar cultures of *S. fructicola*, *R. stolonifer*, *Penicillium* sp., and *Bacterium* sp.

Vandemark (J. S.) & Sharvelle (E. G.). **Prevention of postharvest decay of stone fruits by volatile chemicals.**—*Science*, 115, 2980, pp. 149–150, 1952.

In preliminary experiments at Purdue University, Lafayette, Indiana, in 1950 peach and plum fruits artificially inoculated with a mixed spore suspension of *Monilinia* [*Sclerotinia*] *fructicola* [see preceding and next abstracts] and *Rhizopus* spp. [*R.A.M.*, 28, p. 228 and preceding abstract] were incubated for 24 hours at 80° F. and above 90 per cent. relative humidity prior to treatment with volatile chemicals. Replicated fruit samples were then placed for 24 hours in closed glass cylinders, into which the chemicals were introduced in open glass containers, permitting complete volatilization within the closed treatment cylinder. The fruits were then stored at laboratory temperature and relatively high humidity for another 72 hours. Trichloroethylene (1 vol. non-volatilized chemical in 10,000 vol. air) prevented all breakdown of the fruit, causing no injury to it even at 1 : 4,000. Tetrachloroethylene and 1,1,2-trichloroethane also gave a complete control but caused some

browning of the fruit at 1:4,000 concentration though less at 1:10,000. Similar results, with browning, were obtained with s-tetrachloroethane (1:4,000 and 1:10,000), but lower concentrations might be effective, as the results of a test *in vitro* indicate that it will inhibit pure cultures of *Rhizopus* spp. and *S. fructicola* at 1:20,000.

Sharvelle (E. G.) & Burkholder (C. L.). **Evaluation of fungicides for the prevention of Peach brown-rot.**—*Bull. Ind. agric. Exp. Sta.* 564, 19 pp., 1 fig., 1 diag., 1951.

Owing to the inconclusiveness of the results of field experiments in the Patterson orchard at Vincennes, Indiana, from 1947 to 1949, inclusive, on the value of various fungicides for the prevention of peach blossom blight (*Sclerotinia fructicola*) [*R.A.M.*, 30, p. 48 and preceding and next abstracts], a new greenhouse technique, using more fungicidal treatments with better replications, was developed in 1950. Pots with moist sand, each containing six to eight peach branches, removed from the trees in early April and bearing numerous semi-opened blossoms, were stored at 40° F. Before the commencement of the experiments they were left for 6 to 8 hours at room temperature for the blossoms to open fully. Triplicate samples were then sprayed with various fungicides by means of a vacuum-cleaner type paint gun using 300 ml. per blossom, and after thorough drying were inoculated with a conidial suspension of *S. fructicola*, using an air injection atomizer with a constant 20 lb. air pressure. In some tests the blossoms were drenched with a suspension of freshly discharged ascospores. Each pot was then immediately wrapped completely in cheese cloth, incubated at 75° and 95 per cent. humidity for 24 hours, and then removed to a greenhouse at about 75°. After five days all the blossoms were collected, placed on moistened blotting paper pads, and incubated at high humidity. Incidence of *S. fructicola*, recorded in these samples over a three-day period, was as follows: in 1949, 1·6 per cent. (excellent protection) with lime-sulphur (3 qts. in 100 gals. water), 3·3 per cent. with wettable sulphur (8 lb.), 1·1 per cent. with 1 lb. phygon and no incidence with 2 lb., 4·2 per cent. with wettable sulphur (4 lb.) plus lime-sulphur (2 qts.), and 1·1 per cent. with wettable sulphur (4 lb.) plus phygon (½ lb.), compared with 42·5 per cent. for the untreated; in 1950, 1·8 per cent. for lime-sulphur (3 qts.), 5·4 per cent. for wettable sulphur (8 lb.), and 5·1, 0·3, and 0 per cent. for phygon (½, 1, and 2 lb., respectively), compared with 41·4 per cent. for the untreated.

The same technique was used in the experiments on the eradicant properties of various fungicides when artificially infected blossoms were incubated for 24 hours before spraying. Lime-sulphur, phygon, and ½ lb. phygon plus 4 lb. wettable sulphur all eradicated established infections. The results of three pre-harvest sprays indicate that there is no significant difference in effectiveness between lime-sulphur, phygon, and the combination 2 qts. lime-sulphur plus 4 lb. wettable sulphur. This evaluation was made by comparing the amount of the disease development on samples of fruit [see preceding abstract] collected at intervals during harvest time and held without refrigeration for five days.

Kirby (R. S.). **Mercury sprays give indication of reducing bacterial leaf spot of Peach foliage.**—*Plant Dis. Reptr*, 36, 2, p. 68, 1952. [Multilithed.]

In a demonstration in a commercial peach orchard in York county, Pennsylvania, four applications of puratized agricultural spray at 1 pint per 100 gals., followed by wettable sulphur, gave better control of bacterial leaf spot (*Xanthomonas pruni*) [*R.A.M.*, 30, p. 48] and brown rot (*Monilia* [*Sclerotinia*] *fructicola*) [ibid., 31, p. 243 and preceding abstracts] than wettable sulphur throughout the season. The average percentage of leaves infected with leaf spot was 2·3 for mercury sprayed and 16·6 for sulphur sprayed trees.

United States to be first (averaged data) among 40 preparations tested at $\frac{1}{2}$, $\frac{3}{4}$, or 1 oz. per bush. against wheat bunt [*Tilletia caries* and *T. foetida*], covered and false loose smuts of barley [*Ustilago hordei* and *U. nigra*], oat smut [*Ustilago avenae* and *U. kolleri*: loc. cit.], wheat seedling blight [? *Gibberella zeae*], and [unspecified] flax seed rot.

Sijpesteijn (A. K.) & van der Kerk (G. J. M.). **Investigations on organic fungicides. VI. Histidine as an antagonist of tetramethylthiuram disulphide (T.M.T.D.) and related compounds.**—*Antonie van Leeuwenhoek J. Microbiol. Serol.*, 18, 2, pp. 83–106, 4 pl., 3 graphs, 1952.

In further experiments in this series [cf. *R.A.M.*, 30, p. 177; 31, p. 193] L-histidine inhibited the toxicity of thiram, tetramethylthiuram monosulphide (T.M.T.M.), and dithane to spore germination of *Botrytis cinerea*, *Penicillium italicum*, and *Aspergillus niger*, and of thiram to *Rhizopus nigricans* [*R. stolonifer*], but had no counter-effect on toxicity to mycelial growth. The antagonism appeared to be competitive but so far no conclusion can be drawn as to its precise action. Histidine was more effective at high than at low pH values. As the concentration of the fungicides was increased an inversion of their toxic effect was observed for certain moulds under specified conditions. This phenomenon was also connected with spore germination and was closely related to the histidine antagonism in so far as histidine was only effective at concentrations below those at which inversion took place. Histidine did not inhibit the action of nabam or tetramethylene diisothiocyanate, indicating that their antifungal action is different.

Carpenter (C. P.), Weil (C. S.), & Smyth (H. F.). **Toxicity of an imidazoline (or glyoxalidine) fungicide.**—*Arch. industr. Hyg.*, 4, 5, pp. 494–503, 1951.

Full particulars are given of an extensive study at the Mellon Institute of Industrial Research, University of Pittsburg, on the toxicity to animals of the 341-B formulation of imidazoline (or glyoxalidine) [*R.A.M.*, 31, pp. 133, 189], a white, free-flowing, wettable powder containing 30 per cent. 2-heptadecyl-imidazoline plus 3·3 per cent. 2-heptadecyl-1-hydroxyethylimidazoline dispersed in kaolin, which is used in the United States for the control of cherry leaf spot [*Coccomyces hiemalis*]. It was shown that guinea-pigs can tolerate a daily intake of the compound of at least 450 p.p.m., rats 270 p.p.m., and dogs 210 p.p.m. of their entire dry diet. Evidence presented before the Federal Security Agency in the 1950 hearing on tolerances for poisonous or deleterious residues on fresh fruits and vegetables indicates that the average imidazoline residue at harvest on cherries after spraying with 341-B and unpeeled apples treated with 341-C against scab [*Venturia inaequalis*] is less than 1 p.p.m. It is concluded from these data, coupled with the fact that fruits constitute a relatively small part of human diet, that a wide margin exists between residue levels of imidazoline and the safe level of intake.

New fungicide controls three diseases.—*Seed World*, 70, 3, p. 27, 1952.

Manzate, a new wettable powder fungicide similar to ferbam, ziram, and zineb, is reported from the Ohio Agricultural Experiment Station. Applied at the rate of 2 lb. in 100 gals. water and 150 to 200 gals. per acre at seven- to ten-day intervals it has given excellent control of early and late blights [*Alternaria solani* and *Phytophthora infestans*] of potato and tomato [*R.A.M.*, 30, pp. 494, 625; 31, p. 303] and of tomato anthracnose [*Colletotrichum phomoides*: loc. cit.; ibid., 30, p. 493] in 1950 and 1951 trials. Manzate is available in limited supply this year.

Davis (D.). **Chemotherapeutic activity may be independent of fungitoxicity.**—Abs. in *Phytopathology*, 42, 1, p. 6, 1952.

A comparative study of the chemotherapeutic activity of various compounds

against *Fusarium* [*bulbigenum* var.] *lycopersici* on tomato and their toxicity to the pathogen established no consistent relationship between the two functions, of which the former was determined by Dimond and Chapman's method [*R.A.M.*, 30, p. 417] and the latter by *in vitro* growth and respiratory responses of the mycelium. Both 120 micromolar sodium 2-carboxymethylmercaptobenzothiazole and 410 micromolar 2-(n-amyl)pyridine exerted high chemotherapeutic activity but only partially depressed mycelial growth at 5,000 micromoles per l. The 75 micromolar 4-chloro-3,5-dimethylphenoxyethanol and 86 micromolar n-octadecyltrimethylammonium pentachlorophenate, highly effective as chemotherapeutants, also reduced mycelial growth at equivalent concentrations. A 2,000 micromolar oxyquinoline benzoate failed to control the disease, though it totally inhibited mycelial development at 100 micromoles per l. The inhibition of oxygen uptake by these compounds (except the last-named) corresponded roughly to the growth-arresting capacity. An aqueous extract of whole tomato plants grown for six days on 75 micromolar 4-chloro-3,5-dimethylphenoxyethanol was not toxic to the spores of *Stemphylium sarciniforme*, but macerated tissue from the same plants exhibited an approximately 20 per cent. increase in oxygen uptake and invert sugar content. The far-reaching changes in host metabolism induced by 4-chloro-3,5-dimethylphenoxyethanol may modify the susceptibility of the plant to wilt.

Maan (W. J.). **Het gebruik van vleigtuigen in de land- en tuinbouw.** [The use of aeroplanes in agriculture and horticulture.]—*Meded. Direct. Tuinb.*, 14, pp. 586–596, 6 figs., 1951. [English summary.]

The author discusses the technical, organizational, and economic aspects of plant pest and disease control in Holland by spraying or dusting from aircraft [*R.A.M.*, 31, p. 133] and the comparative merits of ground machinery, helicopters, and ordinary aeroplanes. From a study of the costs involved in the operations it is concluded that the aeroplane deserves a place in the Dutch plant protection programme.

Gram (E.) & Weber (Anna). **Plant diseases in orchard, nursery and garden crops.** —618 pp., 10 col. pl., 348 figs., 1 diag., London, Macdonald & Co. (Publishers) Ltd., 1952. 90*s*.

This translation by Evelyn Ramsden from the Danish of the authors' 'Plantesygdomme: haandbog for frugtavlere, gartnere og haveejere', second edition, 1944, has been edited and adapted for English conditions by R. W. G. Dennis. The treatise is addressed in the first instance to growers, nurserymen, smallholders, and market-gardeners and should also find a place in horticultural and agricultural libraries. Chapter I deals with the nature of plant diseases; II with diseases of tree and bush fruits; III with diseases of vegetables and herbaceous fruit; IV with diseases of ornamental plants and trees; and V with control measures. Each chapter is followed by a bibliography of important contributions to the literature. A special feature of the book is the keys for the diagnosis of diseases by their symptoms, and emphasis is laid throughout on prevention and control or reduction of the losses involved.

Christensen (C. M.). **The molds and man. An introduction to the fungi.**—viii+ 244 pp., 1 pl., 8 figs., University of Minnesota Press, Minneapolis (London, Geoffrey Cumberlege), 1951. 21*s*.

Valuable information is presented in a popular form on the impact of fungi on man and their place in the general scheme of nature, with special reference to some of the more unusual and unfamiliar aspects of the subject. The chapters comprise (1) what fungi do and how they grow; (2) the reproduction and dissemination of

fungi; (3) fungus partnerships with other plants; (4) fungus partnerships with animals; (5) fungus parasites of plants; (6) fungus parasites of plants: rusts, smuts, and heart rot; (7) fungi that destroy commercial products; (8) fungus parasites of micro-organisms and insects; (9) fungus parasites of fish, land animals, and man; and (10) fungi exploited industrially. A summary of the classification of the fungi is given in an appendix.

Goodwin (T. W.). **Fungal carotenoids.**—*Bot. Rev.*, 18, 4, pp. 291–316, 1952.

The author reviews and discusses, with 78 references to the literature, the present state of knowledge concerning carotenoid pigments in fungi under the main headings of occurrence, biogenesis, miscellaneous experiments, carotenoid precursors, and function of carotenoids in fungi.

Legge (Betty J.). **Use of glass fibre material in soil mycology.**—*Nature, Lond.*, 169, 4305, pp. 759–760, 2 figs., 1952.

For the direct investigation of the activity of fungi in soil at the Department of Cryptogamic Botany, University of Manchester, the author used lengths of glass fibre tape 1 in. wide and 0·003 in. thick and glass fibre threads 0·003 in. thick (made by Fibreglass, Ltd., St. Helens, Lancs.) placed on oatmeal agar plates which were then inoculated with species of *Phytophthora*. After one month's incubation the hyphae had become interwoven with the glass fibres and had produced sexual and asexual reproductive structures. The tapes and threads were removed without adhering agar, and with their *Phytophthora* inoculum were buried in the upper six inches of non-sterile garden soil either out of doors or in pots in a cold greenhouse. Subsequent location of the tapes and threads was facilitated by hanging them from lengths of wire just below the soil surface. They were extracted after periods ranging from a day to a year, and the soil washed off under a slow stream of water. After immersion in liquid medium, small portions of the tapes were inserted in surface-sterilized apples to recover the *Phytophthora* species.

After soil burial for one week on glass threads oospores of *P. cactorum* and *P. megasperma* germinated in Petri solution. Oospores were still present on tapes and in agar after burial for one year.

Siu (R. G. H.). **Microbial decomposition of cellulose.**—xi+531 pp., 32 figs., 13 diags., 92 graphs, New York, Reinhold Publishing Corporation; London, Chapman & Hall, Ltd., 1951. $10 or 80*s*.

This monograph, in which the author aims at presenting a comprehensive collection of facts covering the whole subject of fungal and bacterial attack on cotton fabrics [cf. *R.A.M.*, 28, pp. 298, 477, 585; 30, pp. 115, 529, *et passim*], with every relevant reference available at the time of writing, is divided into 12 chapters arranged in five parts dealing, respectively, with cellulose decomposition in nature, (pp. 3–18), structure and properties of cotton fabrics (pp. 21–95), causal organisms (pp. 99–239), mechanism of degradation (pp. 243–316), and methods of prevention (pp. 319–472). The third part consists of a chapter on the morphological and taxonomic aspects of the causal organisms concerned and one on the effect of nutritional and environmental factors on the cellulolytic activity of micro-organisms, the former being subdivided into sections covering general structure and characteristics; isolation and maintenance; identification; assay methods for cellulolytic activity; and cellulolytic fungi, bacteria, actinomycetes, yeasts, algae, myxomycetes, and other important representative micro-organisms. Tables 22 to 30 list, respectively, representative genera of fungi isolated from cotton fabrics exposed in tropical areas; order of abundance of genera among 4,500 fungal isolates from exposed cotton textiles; order of abundance of species among the foregoing;

influence of pH and nitrogen source on development of different micro-organisms; cellulolytic action of bacteria with peptone and nitrate as nitrogen sources; cellulolytic fungi isolated from cotton fabrics (with degree of activity and bibliographic references); non-cellulolytic fungi isolated (with references); fungi isolated not yet tested for cellulolytic activity (with references); and cellulolytic fungi not yet recorded as isolated from cotton fabrics (with references). Indexes are provided to authors, micro-organisms, and subjects, and each chapter has its own exhaustive bibliography.

Kochi (M.), Ruigh (W. L.), Acker (R. F.), Lechevalier (H. A.), & Waksman (S. A.). **Antibiotic-producing properties of Streptomyces 3560, a member of the S. flavus group.**—*Proc. nat. Acad. Sci., Wash.*, 38, 5, pp. 383–391, 1952.

In the Department of Microbiology, New Jersey Agricultural Experiment Station, Rutgers University, a culture of an organism (3560) belonging to the *Streptomyces flavus* group and akin to *S. rimosus*, isolated from a Texas soil, produced an antibacterial agent identical with terramycin [*R.A.M.*, 31, p. 54] and an antifungal agent identical with rimocidin, produced by *S. rimosus* (*Antib. Chem.*, 1, pp. 289–290, 1951). The antifungal agent inhibited the following fungi after 48 hours' incubation at the indicated dilution units/mg.: *Aspergillus niger* 200, *A. nidulans* 60, *Penicillium notatum* 200, *P. citrinum* 90, *Mucor* sp. 100, *Rhizopus nigricans* [*R. stolonifer*] 10, *Fusarium* sp., *Chaetomium* sp., and *Trichoderma* sp. 100, *Pullularia* sp. 500, *Candida albicans* and *Tr*[*ichophyton*] *mentagrophytes* 100, and *Ceratostomella ulmi* 200.

Perlman (D.). **On the effects of biologically active agents on fungi at different stages of growth.**—*Amer. J. Bot.*, 38, 8, pp. 652–658, 1951.

In studies at Princeton, New Jersey, on the growth and metabolism of *Memnoniella echinata* [*R.A.M.*, 27, p. 291; 30, p. 528] in surface culture in a basal salts medium the vegetative cells of the fungus were able to utilize desthio- and oxybiotin effectively in place of biotin, but the germinating spores could not. These were inhibited by γ(3,4-ureylenecyclohexane)butyric acid in the medium at a ratio to biotin of 10,000:1. The fungistatic activity of cobalt ions was greatest towards germinating spores.

Another series of experiments indicated that the effects of ferric ions on the production of citric acid by *Aspergillus niger* [ibid., 30, p. 116] may be associated with the decomposition of the latter by the mould.

Cercós (A. P.) & Castronovo (A.). **Actividad 'in vitro' de la fungocina.** [Activity *in vitro* of fungocin.]—*An. Soc. cient. argent.*, 152, 2, pp. 68–74, 1951. [English summary.]

In further experiments at the Phytotechnical Institute, Ministry of Agriculture, Buenos Aires, Argentina, to determine the anti-fungal properties of fungocin, a tyrosine-containing protein product of *Bacillus subtilis* [*R.A.M.*, 30, p. 59], *Rhizoctonia* [*Corticium*] *solani*, *Botrytis cinerea*, *Diplodia natalensis*, *Sclerotinia sclerotiorum*, and *Sclerotium rolfsii* were among the most sensitive of the plant pathogens tested, succumbing to dosages of 10 μgm. per ml. in the culture medium (Sabouraud's agar). Other species proved more resistant, a concentration of 40 μgm., for instance, being necessary to inhibit the growth of *Fusarium moniliforme* [*Gibberella fujikuroi*] and *F. oxysporum*, while even this dosage (the maximum tested) failed to control *Colletotrichum gloeosporioides* [*Glomerella cingulata*], *Phytophthora drechsleri*, *P. citrophthora*, *Pythium ultimum*, *Penicillium digitatum*, and *P. italicum*.

Behr (E. A.) & Hubert (A. J.). **Preservation of fiber insulating board with copper pentachlorophenate.**—*Tappi* (Tech. Ass. Pulp Pap. Ind.), 34, 11, pp. 519–523, 1951.

Retentions of copper pentachlorophenate [*R.A.M.*, 29, p. 446] of or exceeding 85 per cent. can be obtained in fibre boards [cf. ibid., 29, p. 326] by the use of stoichiometrical amounts of reactants. The compound may be added to the pulp slurry after fermentation in an external reaction vessel or formed by introduction of the copper sulphate and technical sodium pentachlorophenate (dowicide G) [ibid., 29, pp. 548, 597] solutions in the pulp slurry. The final pH of the mixture should be 5·2 or a little higher for best retentions. Drying conditions approximating to commercial practice in fibreboard manufacture (16 hours at 212° F., 17 at 221°, 1½ at 293°, and 36 minutes at 360°) do not materially reduce retention.

Ritchie (W. H.). **Fungicides in paints and other protective coatings.**—*Paint Tech.*, 16, 191, pp. 481–484, 1951.

This lecture, given to the Hull Section of the Oil and Colour Chemists' Association on 5th February, 1951, presents useful, up-to-date information on the control of mould damage to paint, varnishes, and lacquers by the use of resistant finishes and the incorporation of fungicides, e.g., copper-8-quinolinolate (milmer 1), pentachlorophenol (santophen 20), and sodium pentachlorophenol (santobrite) [cf. *R.A.M.*, 28, p. 136; 31, p. 136, *et passim*].

Cooper (D. C.), Rieman (G. H.), Hougas (R. W.), Stokes (G. W.), & Gasiorkewicz (E. C.). **Mycorrhizalike mycelium in Potato tubers.**—Abs. in *Phytopathology*, 42, 1, p. 25, 1952.

The examination of the tubers of 49 potato varieties and strains obtained from different parts of Wisconsin, of commercial varieties from eight other States, and of six species of *Solanum* revealed the presence in all the material of mycorrhizoid mycelium [*R.A.M.*, 26, p. 261]. The fungus penetrates the apex of the stolon, traverses the cortical cell layers, and becomes associated with the phloem parenchyma. Shortly afterwards tuberization is initiated. The non-septate mycelium is both inter- and intracellular, becoming coiled in occasional host cells. In preliminary tests plants grown from true seed on a sterile substrate gave rise to numerous stolons without tuber formation.

Harley (J. L.) & McCready (C. C.). **The uptake of phosphate by excised mycorrhizal roots of the Beech. II. Distribution of phosphorus between host and fungus.**—*New Phytol.*, 51, 1, pp. 56–64, 1 pl., 1 diag., 1 graph, 1952.

In further studies in the Department of Botany, Oxford University [cf. *R.A.M.*, 30, p. 239], excised tips of mycorrhizal beech roots [ibid., 30, p. 624] were dissected, separating the fungal sheath from the core, after absorbing radioactive phosphorus from aerated media at pH 5·5. Approximately 90 per cent. of the phosphorus accumulated in the fungal sheath, the distribution being constant over a wide range of dilute phosphate concentrations at various times in the growing season. No significant change in the ratio occurred over a 24-hour period using a concentration of 1 mg./l. Cores freed from their sheaths before exposure to phosphate absorbed phosphorus four times more quickly than the cores of intact tips.

Hessayon (D. G.). **Effect of auxins on the mycelial growth of Fusarium oxysporum var. cubense.**—*Nature, Lond.*, 169, 4306, pp. 803–804, 1 fig., 1 graph, 1952.

Studies carried out in the Department of Cryptogamic Botany, University of Manchester, on the effect of 3-indoleacetic acid and 3-indoleacetonitrile (in comparison with phenol) on the growth of *Fusarium oxysporum* var. *cubense* [cf. *R.A.M.*,

31, p. 135] showed that on a rich glucose-ammonium agar both auxins were more fungitoxic than phenol. Swelling and bursting of the hyphal tips accompanied complete inhibition by 800 p.p.m. of the latter auxin. On a starvation medium of 2 per cent. agar fungitoxicity diminished at high concentrations, and there was slight stimulation at low ones. Apparently the rate of auxin synthesis is not a limiting factor for growth on nutrient media, but may be so on starvation media, owing to the scarcity of available nitrogen compounds. The absence of marked stimulation on plain agar may be due to the fact that agar contains complex nitrogen compounds, including growth factors; 800 p.p.m. of 3-indoleacetonitrile was completely inhibitory on this medium also, but there was no distortion of the hyphal tips.

Köhler (E.) & Bode (O.). **Elektronenmikroskopische Untersuchung des Kartoffel-X-Virus.** [Electron microscope study of the Potato X-virus.]—*Naturwissenschaften*, 38, 15, p. 355, 1951.

Electron microscope studies of samples of potato virus X secured by J. Johnson's [water pressure] method [*R.A.M.*, 30, p. 403] revealed hitherto undescribed structural characters at the Virus Research Institute, Celle, Hanover. The particles were arranged in a regular network, consisting for the most part of three-stranded plaits. Some were composed of only two strands, while single particles were occasionally observed.

Sprau (F.). **Zur Frage der Übertragung des Y-Virus der Kartoffel durch Samen.** [On the question of transmission of Potato virus Y through the seed.]—*Pflanzenschutz*, 3, 10, pp. 128–129, 1951.

Conflicting reports in the literature as to the transmissibility of potato virus Y through the true seed [*R.A.M.*, 10, p. 813; 23, p. 240] led to the performance of experiments at the Bavarian Institute of Agriculture and Plant Protection to elucidate the facts. Seeds from the highly susceptible Biene variety were overwintered in the greenhouse, and after washing, three series were sown in frames in mid-March. Most of the resultant seedlings, 476 in all, were normal. Some, however, displayed symptoms suggestive of potato leaf roll and Y viruses, and these were grown in an aphid-free house for $2\frac{1}{2}$ months, when 15 out of the 206 plants comprising the first series, six out of 153 of the second, and nine out of 117 of the third showed virus Y symptoms. In transmission tests to tobacco and *Nicotiana glutinosa*, seven plants in the first series, none in the second, and five in the third induced typical symptoms on the two hosts.

As in the case of certain other seed-borne viruses, varietal susceptibility is probably concerned in the transmission of potato virus Y. However, the failure of all the tests in the second series and the low percentages of infection in the others argue an extraordinary instability in the capacity for transmission, so that large-scale production of virus-diseased seedlings, even in crosses between infected parents, is not to be anticipated. Nevertheless, the foregoing observations point to the need for testing selected seedlings for virus Y to obviate the introduction of latent infection into new lines.

Sprau (F.). **Über das Auftreten einer neuen Viruskrankheit — Zweigstrauchvirose — an Kartoffeln.** [On the occurrence of a new virus disease—dwarf shrub virosis —in Potatoes.]—*Pflanzenschutz*, 3, 10, pp. 125–126, 1 fig., 1951.

The sprouts of potato tubers submitted for inspection to the Bavarian Institute of Agriculture and Plant Protection, Munich, in the spring of 1950, had developed into numerous filiform branches, which on planting produced minute leaves, mostly without pinnae. The shoots gradually acquired the aspect of a dwarf shrub, almost like a cushion, the height of which in extreme cases did not exceed 4 to 6 cm., while

the surface of a flower pot 18 cm. wide was completely covered. The diameter of the individual branches ranged from 0·2 to 1·5 mm. All the axillary buds had opened and put out non-pinnate leaves of normal shape, 0·5 to 1 by 0·25 to 6 cm., the same process being repeated by the axillary buds of these branches. The internodes of the shoots were truncated. Initially light green, the leaves turned darker then later paled once more to a light green to yellow, the veins tending to remain dark. At an advanced stage the larger leaves begin to roll lightly inwards from the margin and ultimately assume a purple to reddish tone, most conspicuous at the edges. The numerous small, elongated tubers formed underground repeatedly produce new ones, the 'eyes' of which again give rise to fresh growth, culminating in a cushion, sometimes of considerable extent. After a time nothing remains but the empty cork sheaths of the diminutive tubers. Flowering has not been observed. In some varieties the sprouts tend to form aerial tubers.

The symptoms of the disease were suggestive of virus infection, and the disease was successfully transmitted by grafting to Ackersegen and other potato varieties, tomato, *Solanum demissum*, *S. nigrum*, tobacco, *Datura stramonium*, and *Petunia*. All attempts at transmission by means of sap inoculation or insects proved fruitless. The dwarf shrub virus presents a number of analogies with potato witches' broom [*R.A.M.*, 29, p. 273] and tomato witches' broom viruses [ibid., 8, p. 122], and the question of its relationship to them requires further study.

Grancini (P.). **Recenti progressi nella produzione delle Patate da semina in una zona della Germania occidentale.** [Recent advances in the production of seed Potatoes in a zone of western Germany.]—*Ann. Sper. agr.*, N.S., 5, 6, pp. 69–79, 1951. [English summary.]

After discussing the problem of potato degeneration [*R.A.M.*, 31, p. 201] the author gives some information on seed potato production at experiment stations and commercial firms in the Uelzen district of western Germany [loc. cit.] gathered during a visit in December, 1950.

Pristou (R.) & Gallegly (M. E.). **Leaf penetration by Phytophthora infestans.**—Abs. in *Phytopathology*, 42, 1, pp. 16–17, 1952.

The mode of penetration by the common physiologic race of *Phytophthora infestans* from potato [*R.A.M.*, 28, p. 483] into the leaves of Wisconsin 55 tomato [cf. below, p. 406] and resistant (Kennebec) and susceptible (Cobbler) potato was studied [at the Wisconsin Agricultural Experiment Station]. Leaflets with drops of a zoospore or sporangial suspension were incubated at 20° C. for 2, 6, 12, 24, 48, and 96 hours. The zoospores invariably produced an appressorium before penetration. Closely affixed to the epidermal cell it was about the same size as the zoospore and separated from the germ-tube by a cross wall. After appressorium formation the zoospore and germ-tube were empty of protoplasm. An infection peg entered through a small aperture in the epidermal cell. The entire process of zoospore germination, appressorium formation, and penetration often took place two hours after inoculation.

Baldacci (E.). **Chiavi analitiche delle principali malattie del Riso in Italia.** [Analytical keys to the principal diseases of Rice in Italy.]—Reprinted from *Risicoltura, 1950*, 4–5, 11 pp., 1950.

The information in this paper has already been noticed from another source [*R.A.M.*, 29, p. 530].

Kuang (H. H.). **Studies on Rice cytology and genetics as well as breeding work in China.**—*Agron. J.*, 43, 8, pp. 387–397, 1951.

Included in this useful survey of Chinese studies on the cytology and genetics of

rice and of the breeding work in progress at the Rice and Wheat Improvement Station of the Szechuan Provincial Agricultural Improvement Institute is the information that the hybrid variety K 110 is resistant to *Piricularia oryzae* [*R.A.M.*, 27, p. 444; 31, p. 204].

Baba (I.). **On the extreme sterility, so-called 'straight head' of Rice plant, [which] occurred in farmers' field of Chiba Prefecture owing to dry weather in 1947.**—*Bull. Inst. agric. Sci., Tokyo*, Ser. D, 1, pp. 37–48, 3 figs., 1 graph, 2 maps, 1951. [Japanese, with English summary.]

The acute form of sterility known as 'straight head' in rice [*R.A.M.*, 30, p. 487] was prevalent during the drought of 1947 along the Kujūkuri coast of Chiba Prefecture, Japan, especially in late-maturing varieties of a glutinous consistency. The writer attributes the disorder to the continuous development of the inflorescence under dry conditions, combined with a temporary disequilibrium in the water supply, which prevails daily for a short period at noon when transpiration is accelerated.

Malaguti (G.), Silva (J. S.), & Ravanello (G.). **Ensayos acerca de la influencia del abonamiento sobre el 'brusone del Arroz' (Piricularia oryzae Cav.).** [Experiments on the influence of fertilizing on 'Rice brusone' (*Piricularia oryzae* Cav.).] —*Agron. trop., Maracay*, 1, 2, pp. 131–148, 2 figs., 4 graphs, 1951. [English summary.]

From the results of experiments at the National Institute of Agriculture, Maracay, Venezuela, to determine the influence of the kind and time of application of soil amendments on the development of rice blast (*Piricularia oryzae*) [*R.A.M.*, 31, p. 82], it is concluded that nitrogenous fertilizers (represented in these trials by 20 per cent. ammonium sulphate) aggravate the severity of the disease. This effect could be minimized, however, by giving the dressings in two parts, one at the time of sowing and another two months later. Phosphate (20 per cent.) did not appear to influence the incidence of infection, while the resistance of the plants seemed to be increased by 50 per cent. potassium chloride.

Dijkman (M. J.). **Hevea. Thirty years of research in the Far East.**—xxii+329 pp., 88 figs., 20 diags., 56 graphs, 4 maps, Coral Gables, Florida, University of Miami Press, 1951. $6.

In the chapter of this book dealing with pests and diseases of *Hevea* rubber, mainly in Indonesia (pp. 144–154) [cf. *R.A.M.*, 4, p. 701], the author succinctly reviews, with numerous references to the literature, the information so far available. In Indonesia the worst diseases of *Hevea* are those affecting the root system and these are listed in order of their importance as follows: *Fomes lignosus* [ibid., 30, p. 343], *Ganoderma pseudoferreum* [ibid., 23, p. 289], *F. noxius* [ibid., 18, p. 728], *Xylaria thwaitesii* [ibid., 18, p. 579], *Sphaerostilbe repens* [cf. ibid., 29, p. 170], *Helicobasidium compactum* [ibid., 18, p. 546], and *Ustulina zonata* [ibid., 18, p. 579; 21, p. 42]. Diseases of the trunk and branches, including stripe canker (*Phytophthora palmivora*) [ibid., 30, p. 74], patch canker, foot disease, and die-back due to *P. faberi* [*P. palmivora*: ibid., 27, p. 160; see also ibid., 21, p. 323] are widespread in Java and Sumatra; mouldy rot (*Ceratostomella fimbriata*) [ibid., 30, p. 74] is generally found only under very wet conditions, but pink disease (*Corticium salmonicolor*) [ibid., 16, p. 634; 23, p. 290; 31, p. 295] attacks about 140 hosts and is favoured by excessive humidity. Diseases of the leaves and fruit include mildew (*Oidium heveae*) [ibid., 30, p. 286] which can cause considerable damage especially in the dry monsoon after wintering; leaf blight (*Phytophthora* spp.) [cf. ibid., 17, p. 63; 29, p. 170], which is responsible for injury in certain regions of Java and

Sumatra, *Helminthosporium* leaf spot, of little importance, and physiological disorders including brown bark [brown bast: ibid., 17, p. 414; 29, p. 53] and deficiency disorders [ibid., 30, p. 192]. A species of *Oospora* living in the soil is capable of reducing germination of seed in the germination beds from 78 to 18 per cent. A bibliography of 28 titles is appended.

Buchner (A.). **Die Wirkung der Chlorionen auf den Kohlenhydratstoffwechsel in Abhängigkeit von der Kaliversorgung der Pflanze.** [The influence of chlorine ions on carbohydrate metabolism in relation to the potassium supply of the plant.]—*Z. PflErnähr.Düng.*, 54 (99), 1, pp. 28–36, 7 graphs, 1951.

In sand pot experiments with bush beans [*Phaseolus vulgaris*], buckwheat, sunflower, and summer wheat and barley at the Institute of Agricultural Chemistry, Weihenstephan, Bavaria, the influence of chlorine ions on the plants was shown to be dependent on the potassium supply. Chlorine nutrition further aggravates the hydrolytic activity already promoted by potassium deficiency in contrast to the synthetic processes resultant on normal nutrition. Beans supplied with chloride developed the injury to the leaf margins characteristic of potassium deficiency [*R.A.M.*, 27, p. 462], associated with an adverse potassium to chlorine ratio.

Chesters (C. G. C.) & Rolinson (G. N.). **The role of zinc in plant metabolism.**—*Biol. Rev.*, 26, 3, pp. 239–252, 1951.

This useful review of the literature on the function of zinc in plant metabolism [*R.A.M.*, 27, p. 42] (with shorter sections on its part in the growth of fungi and animals) is followed by a bibliography of 79 titles.

Chona (B. L.) & Hingorani (M. K.). **Comparative studies of certain isolates of Colletotrichum falcatum Went.**—*Indian Phytopathology*, 3, 2, pp. 196–202, 1951.

Studies carried out at the Indian Agricultural Research Institute, New Delhi, on three isolates of *Colletotrichum falcatum* [*Physalospora tucumanensis*: cf. *R.A.M.*, 31, p. 87] obtained from sugar-cane, viz., 3, 29, and 78 [loc. cit.], showed that there was no conspicuous difference in the growth rate of the three isolates on different media or under various temperature and pH conditions. All grew best on oatmeal agar. Optimum growth occurred at pH 5·7 and at 30° C.; it was very slight at 10° and nil at 40°; isolate 78 gave best growth in the acid range, isolate 3 in the alkaline, and isolate 29 was intermediate. Isolates with dark mycelium and small spores were more virulent than others with paler mycelium and larger spores.

Chona (B. L.) & Munjal (R. L.). **A new smut of Sugarcane.**—*Curr. Sci.*, 20, 11, pp. 301–302, 9 figs., 1951.

In June, 1950, Co. 560 and Co. 561 sugar-cane plants at Karnal, India, were observed to be affected by an ovariicolous smut which caused stunting, shortening of the internodes, profuse tillering, production of laterals through sprouting of the normally dormant buds, resulting in a bushy appearance of the shoots, and precocious flowering (May to June). Nearly all the panicles and all the flowers are infected. The pathogen was shown by morphological and cultural studies to be in close agreement with *Sphacelotheca cruenta* [*R.A.M.*, 27, p. 467]. Since the host of this smut, *Sorghum halepense*, is one of the parents of the two affected sugar-cane varieties, the ovariicolous smut is referred to *S. cruenta*.

Arruda (S. C.) & Toffano (W. B.). **O carvão da Cana no Estado de São Paulo.** [Cane smut in the State of São Paulo.]—*Biológico*, 17, 9, pp. 155–165, 1 col. pl., 1951.

Useful information on the history, economic importance, symptomatology, etiology, and control of sugar-cane smut (*Ustilago scitaminea*) is recapitulated. In

São Paulo, Brazil [*R.A.M.*, 31, p. 207], methods of combating the disease are essentially preventive and consist mainly in varietal selection and the production of setts in special nurseries. The cultivation of susceptible varieties, such as P.O.J. 36, P.O.J. 213, and C.P. 29/320, is prohibited by law. As the resistance of Co. 331 and C.P. 34/120 has proved inadequate in the Alta Sorocabana region, it is suggested they should no longer be grown there. Among the resistant varieties Co. 290, Co. 413, Co. 421, C.P. 27/139, C.P. 29/137, P.O.J. 2727, and P.O.J. 2878, Co. 290 presents outstanding agricultural and industrial advantages, and should occupy at least 50 per cent. of the acreage under the crop.

After this paper had gone to press, a case of infection in Co. 290 planting cane was discovered in Piracicaba, showing the marked capacity of the parasite for dissemination and emphasizing the urgency of constant vigilance in the nursery to prevent any further extension of the disease wherever it may appear.

Cooke (W. B.) & Shaw (C. G.). **Notes on Alaskan fungi.**—*Res. Stud. St. Coll. Wash.*, 20, 1, pp. 15–19, 1952.

The following fungi were among those collected in 1950 on Prince of Wales Island, Alaska: *Didymascella thujina* [C.M.I. map No. 149], *Polyporus* [*Polystictus*] *cuneatus* [*R.A.M.*, 20, p. 388], and *Poria weirii* [ibid., 31, p. 131] on *Thuja plicata*; *Lophodermium* sp., *Fomes robustus* [ibid., 24, p. 299], *F. annosus* [ibid., 27, p. 105] (common), and *Polyporus* [*Polystictus*] *abietinus* [ibid., 30, p. 594] on *Tsuga heterophylla*; *L. piceae* [ibid., 12, p. 254] on needles of Sitka spruce (*Picea sitchensis*); *Stilbum glomerulaespora* [ibid., 5, p. 81], associated with a canker of the same host; *L. pinastri* [ibid., 31, p. 40] on *Pinus contorta* var. *latifolia* (lodgepole pine); *Vaccinium rust* (*Pucciniastrum goeppertianum*) [ibid., 27, p. 30], very common everywhere on *Vaccinium* and *Abies* species; *Stereum rugisporum* [ibid., 22, p. 232] commonly causing decay of fallen coniferous wood; and *Lenzites sepiaria* [ibid., 30, p. 594] and *Polyporus fibrillosus* [ibid., 19, p. 445] on *Picea sitchensis* along the west coast.

Thirumalachar (M. J.) & Narasimhan (M. J.). **Critical notes on some plant rusts III.**—*Sydowia*, 5, 3–6, pp. 476–483, 4 figs., 1951.

From a consideration of the structure of the fructifications the authors conclude that *Kweilingia*, described as a rust genus by Teng, with the type species *K. bambusae* on bamboo in China [*R.A.M.*, 21, p. 45], should be assigned to the Auriculariales rather than to the Uredinales.

Uraecium Arth. [ibid., 13, p. 185] is relegated to synonymy with *Uredo* on the basis of structural identity.

At least one of the chief functions of the viscid cysts subtending the teleutospore heads of *Ravenelia hobsoni* (and characteristic of all species of *Ravenelia*) is to attach the spores to the leaves of the host, *Pongamia glabra*.

Fischer (G. W.). **Some new species of Ustilaginales from North America.**—*Res. Stud. St. Coll. Wash.*, 20, 1, pp. 3–10, 5 pl., 1952.

Eleven new species of Ustilaginales from North America are described, including *Entyloma montis-rainieri* G. W. Fischer & W. B. Cooke on *Polemonium californicum* from Yakima and Mt. Rainier Parks, Washington, and *Ustilago compacta* on herbarium specimens of *Lolium multiflorum* from Oregon. The former has sori which are often confluent, remaining green after unaffected areas of the leaflets become yellowed, and spores which are hyaline to pale yellowish, 15 to 27 μ in diameter including the two-layered exospore; the spore wall proper is 1·5 to 2 μ thick, smooth, and the enveloping, hyaline, irregularly thickened gelatinous sheath, 2 to 5 μ thick. *U. compacta* has reddish brown to dark olive brown spores, 8 to 10 μ in diameter

and up to 13 μ in length, which, when properly orientated, are seen to have a slightly darker equatorial band; they are smooth except where the exospore breaks up into irregular roughened areas on the lighter coloured polar regions.

Diehl (W. W.). **Balansia and the Balansiae in America. Additions and corrections.** —*Plant Dis. Reptr*, 36, 2, pp. 55–56, 1952. [Multilithed.]

The author gives additional information and some corrections to his work on *Balansia* and the Balansiae in North and South America [cf. *R.A.M.*, 30, p. 491].

Thirumalachar (M. J.) & Mundkur (B. B.). **Genera of rusts. Appendix.**—*Indian Phytopathology*, 3, 2, pp. 203–204, 1951.

Two genera are added to the authors' list of rust genera [*R.A.M.*, 30, p. 248], *Didymosporella* Thirumalachar (*Sci. & Cult.*, 16, p. 210, 1950, and *Sydowia*, 5, p. 29, 1951) and *Polioma* [*R.A.M.*, 30, p. 345].

Hiratsuka (N.). **Materials for a rust-flora of Eastern Asia (1).**—*J. Jap. Bot.*, 27, 4, pp. 111–116, 1952.

This list, comprising 26 rust fungi occurring in eastern Asia (chiefly Japan) [*R.A.M.*, 29, p. 585], includes three new species and one new name. *Uredinopsis filicina* occurs on *Abies homolepis* in Japan [cf. ibid., 28, p. 605], a new host record, and *Phakopsora fici-erectae* on white mulberry (*Morus alba*) [ibid., 30, p. 490] and *M. australis*, both in Japan and Formosa, and on *M. bombycis* in Japan.

Cummins (G. B.). **Uredinales from various regions.**—*Bull. Torrey bot. Cl.*, 79, 3, pp. 212–234, 21 figs., 1952.

This annotated list of plant rusts from North and South America, Africa, Cyprus, India, and New Guinea includes descriptions of 38 new species and two new varieties. Seven are redescribed or reduced to synonymy. *Cerotelium combreti* n.sp. was found on *Combretum* sp. in Uganda; *Hemileia mandevillae* n.sp. on *Mandevilla* sp. in Kenya; *Prospodium oblectum* n.sp. on *Clytostoma callistegioides* in Brazil, Uruguay, and Argentina; and *Ravenelia wiehei* n.sp. on *Cassia* sp. in Nyasaland.

Lacy (R. C.). **Studies on some Indian Synchytria. I. Four new species from Bihar.** —*Indian Phytopathology*, 3, 2, pp. 155–161, 2 figs., 1951.

Descriptions are given of four new species of *Synchytrium* from near Patna, Bihar, India. In *S. stereospermi* n.sp., on the garden plant *Stereospermum suaveolens*, the prosorus measures 100 to 200 μ in diameter, the sporangia 20 to 22 by 24 to 28 μ, and the resting spores 84 to 118 μ in diameter, with a wall up to 11 μ thick. In *S. sesamicola* n.sp. on sesame no prosorus was observed; the resting spores are 78 to 128 μ in diameter, with a wall up to 6 μ thick. *S. nyctanthidis*, on the ornamental tree *Nyctanthes arbor-tristis*, has resting spores 48 to 72 μ in diameter, with a wall up to 5 μ thick.

Holm (L.). **Taxonomical notes on Ascomycetes. II. The herbicolous Swedish species of the genus Leptosphaeria Ces. et De Not.**—*Svensk bot. Tidskr.*, 46, 1, pp. 18–46, 5 figs., 1952.

A determinative key to 62 herbicolous species of *Leptosphaeria* in Sweden is given and notes on the distribution, hosts, and diagnostic features of each species. One new species is described.

Crop protection courses 1951.—*Tea Quart.*, 22, 2, pp. 55–92, 3 pl., 10 figs., 1 diag., 1951.

Three-day courses on crop protection in connexion with tea blister blight

(*Exobasidium vexans*) in Ceylon [*R.A.M.*, 31, p. 355], given at four centres between April 17th and May 10th, 1951, included lectures which are here reproduced under the titles: I Introductory lecture, by J. Lamb; II The causative fungus, by C. A. Loos; III Physiology of the tea bush, by G. B. Portsmouth; IV Fungicides and their application, by J. Lamb; V Field organization, and VI An estimate of the extent of crop losses on St. Coombs following the arrival of blister blight in Ceylon, both by G. B. Portsmouth.

From his study of the fungus Loos concludes that germination and appressorium formation [ibid., 29, p. 538] takes 6 to 16 hours and during this time the fungus is very vulnerable to fungicides, desiccation, and sun injury. Within eight to ten days after infection a translucent spot appears and seven to nine days later (15 to 17 days after infection) the fungus ruptures the lower epidermis and spores are formed, the white blister being very evident 18 to 21 days after infection.

The yields of made tea in a long-term cultivation and weeding experiment at St. Coombs in the periods 1939 to 1943, 1943 to 1947 (mostly before blister blight began), and 1947 to 1951 (subject to blister blight throughout) were 819, 867, and 675 lb., respectively, indicating an average decrease of 20 per cent. Greater losses were probably incurred on estates more severely affected. Assuming that weekly spraying gives almost complete protection, the loss of crop due to blister blight amounted to an average of 23·5 per cent. from July, 1949, to July, 1951, in the St. Coombs No. 9 Field Crop Protection Experiment, thus confirming the loss estimate in the previous test.

Miyakawa (T.) & Yoshii (H.). **Transmission of Tobacco mosaic virus by the Dodder, Cuscuta japonica, and its inhibitory effect on the virus activity.**—*Sci. Bull. Fac. Agric. Kyushu Univ.*, 12, 2, pp. 143–154, 1 fig., 2 graphs, 1951. [Japanese, with English summary.]

Out of 54 Bright Yellow and Turkish tobacco plants inoculated with tobacco mosaic virus by means of the dodder, *Cuscuta japonica* [cf. *R.A.M.*, 29, p. 9], at the Faculty of Agriculture, Kyushu University, Japan, 11 contracted infection, gauged by the local lesion method on *Nicotiana glutinosa*. The active virus concentration of expressed sap from the dodder stems parasitic on tobacco plants was materially lower than that of the diseased host; in diluted dodder sap it was somewhat higher than in the undiluted. An alcohol-soluble substance inhibiting the activity of the virus was demonstrated in healthy dodder sap. The inhibitor survived desiccation in the dodder stem and withstood a temperature of 100° C.

Forster (R.). **Inativação do vírus do mosaico comum do Fumo pelo filtrado de culturas de Trichoderma sp.** [Inactivation of the virus of common Tobacco mosaic by a culture filtrate of *Trichoderma* sp.]—*Bragantia, S. Paulo*, 10, 5, pp. 139–148, 1950. [English summary.]

At the Agronomic Institute, Campinas, São Paulo, Brazil, a culture filtrate of a species of *Trichoderma* grown in a liquid medium of the composition used by Weindling [*R.A.M.*, 14, p. 248] caused a reduction of up to 90 per cent., measured by the number of local lesions on inoculated half leaves of *Nicotiana glutinosa*, in the infectivity of a strain of tobacco mosaic virus from the University of California, Berkeley. The inactivation occurred within two minutes of contact between the culture filtrate and the virus, and the effect was not enhanced by longer standing. After the second day the inactivating capacity of the filtrate declined in cultures kept in the light, whereas in darkness it continued to increase in potency for at least 22 days. A possible reason for the weakening of the inactivator in daylight is the physiological activity associated with sporulation, which was not observed in darkness.

Attempts at the extraction of the inactivating principle with chloroform [ibid., 16, p. 268] were unsuccessful, suggesting that it may not be the same as the one discovered by Weindling in his experiments with *Rhizoctonia* [*Corticium solani*: ibid., 21, p. 155]. The inactivator could not be separated from the filtrate by ultracentrifugation at 35,000 r.p.m. A whitish precipitate obtained by Takahashi's acetone method [ibid., 21, p. 465] depressed virus activity.

Burger (W. C.) & Stahmann (M. A.). **The combination of lysine polypeptides with Tobacco mosaic virus.**—*J. biol. Chem.*, 193, 1, pp. 13–22, 2 figs., 2 graphs, 1951.

In further studies at the College of Agriculture, University of Wisconsin, synthetic lysine polypeptides [*R.A.M.*, 31, p. 90] were shown to combine with and precipitate tobacco mosaic virus, resembling in this respect chupeine [cf. ibid., 17, p. 564], ribonuclease [ibid., 21, p. 392], and the virus-inhibiting protein from *Phytolacca* [spp., ibid., 31, p. 221]. Free lysine exerted no such effect.

The inhibitory action of lysine polypeptides on tobacco mosaic virus infectivity was demonstrated to be a function of their molecular weight and concentration. A theory involving the formation of many ionic bonds between the virus and polypeptide, leading to inhibition of infectivity and aggregation of the virus particles, is postulated to explain the great difference between the effects of the amino acid itself and its polypeptides.

Schachman (H. K.). **Ultracentrifuge studies on Tobacco mosaic virus.**—*J. Amer. chem. Soc.*, 73, 10, pp. 4808–4811, 3 diags., 1951.

Recent progress in the theoretical and technical aspects of ultracentrifugation led to a re-examination at the Virus Laboratory, University of California, Berkeley, of purified tobacco mosaic virus with a view to gaining information as to the uniformity of the component particles. Experiments are described which demonstrate the existence of boundary-sharpening for solutions containing rod-like particles. The importance of this effect in the analysis of boundary shape is discussed in relation to the determination of homogeneity. Evidence from boundary-spreading tests is adduced to show that the virus preparations used in these studies are more homogeneous than those previously investigated [*R.A.M.*, 26, p. 515]. An anomaly in the centrifugation of mixtures has been applied to the detection of small amounts of trailing components. The material under observation (derived from juice extracted from diseased Turkish tobacco plants) contained a maximum of 1 per cent. of monodisperse $\frac{3}{4}$-length particles.

The results of this work are in agreement with those obtained by Williams *et al.* [ibid., 31, p. 212].

Cuzin (J.), Schwarz (D.), & Breton (C.). **Réaction allergique d'une variété de Nicotiana tabacum vis-à-vis de la mosaïque du Tabac.** [Allergic reaction of a variety of *Nicotiana tabacum* to Tobacco mosaic.]—*Ann. Inst. Pasteur*, 81, 3, pp. 300–305, 1951.

In experiments in France the initial reaction of a tobacco plant of the J.I.C. variety (Java Isère × Cabot) to tobacco mosaic virus [*R.A.M.*, 29, p. 585] consisted in the development of necrotic lesions round the site of inoculation, followed by typical systemic symptoms. Inoculation of another leaf of the same plant with the same strain of the virus resulted in the production of a much smaller number of lesions than on the first leaf. This response may be regarded as allergic and is probably quantitative, the number of lesions diminishing progressively with each further inoculation. Using this reaction as a criterion, the presence of the virus could be located in a given region of the plant, and the application of the method to the study of its movement from the site of inoculation gave results conforming to accepted hypotheses.

Van der Want (J. P. H.). **Reaction of some Nicotiana species to Tobacco rattle virus.**—Reprinted from *World Tobacco Congr., Amsterdam, 1951, Free Treatises*, pp. 133–139, 1951. [French summary.]

Since none of the 23 tobacco varieties inoculated with the tobacco rattle virus [*R.A.M.*, 31, p. 123] at the Institute for Phytopathological Research, Wageningen, Holland, showed any indication of resistance, 37 *Nicotiana* species were tested in the field or greenhouse or both for their reactions to the disease. Of the five in the section Paniculatae, *N. paniculata*, *N. knightiana*, *N. benavidesii*, and *N. raimondii* contracted both local and systemic symptoms, while *N. glauca* developed the former type only. Among the Tomentosae *N. glutinosa* was the sole species to become both locally and systemically infected, *N. tomentosa*, *N. tomentosiformis*, and *N. otophora* showing local lesions only, while *N. setchellii* remained apparently healthy, though it may have harboured the virus in a masked form. In the Undulatae *N. undulata*, *N. wigandioides*, and *N. arentsii* developed local necroses only, and a similar reaction characterized *N. repanda* (Alatae), *N. acuminata* (Acuminatae), and *N. suaveolens* and *N. debneyi* (Suaveolentes). Both local and systemic infection was contracted by *N. trigonophylla* (Trigonophyllae), *N. sylvestris* (Alatae), *N. bigelovii* (Acuminatae), and *N. gossei*, *N. goodspeedii*, *N. megalosiphon*, and *N. rotundifolia* (Suaveolentes). *N. palmeri* (Trigonophyllae), *N. longiflora* and *N. plumbaginifolia* (Alatae), and *N. nudicaulis* (Acuminatae) developed local lesions and possibly also systemic necroses. The hybrids *N. tomentosa* × tobacco and *N. tomentosiformis* × tobacco were as susceptible as tobacco, indicating that resistance in *N. tomentosa* and *N. tomentosiformis* is governed by one or more recessive factors.

Costa (A. S.). **Beta patellaris, planta-teste para o vírus da necrose branca do Fumo.** [*Beta patellaris*, a test plant for the Tobacco white necrosis virus.]—*Bragantia, S. Paulo*, 10, 9, pp. 275–276, 1 pl., 1950. [English summary. Received May, 1952.]

Among the numerous representatives of several plant families tested for their suitability as indicators for the tobacco white necrosis or 'cabbage' tobacco virus (probably a strain of tobacco streak [*R.A.M.*, 24, p. 477]), *Beta patellaris* gave the most satisfactory results. Local lesions developed on the leaves two days after inoculation and could be counted after four. *Cyamopsis tetragonoloba*, which served as a host in Fulton's experiments [ibid., 28, p. 85], reacted negatively in the author's tests, while the lesions developing on *Nicotiana rustica*, used as an indicator by Diachun and Valleau [ibid., 29, p. 567], were not satisfactory for the purpose in view.

Fraga (C. G.) & Costa (A. S.). **Análise de um experimento para combate de viracabeça do Tomateiro.** [Analysis of an experiment on Tomato spotted wilt control.]—*Bragantia, S. Paulo*, 10, 10, pp. 305–316, 1 graph, 1950. [English summary. Received May, 1952.]

The results of a statistical analysis of an experiment at Campinas, São Paulo, Brazil, on tomato spotted wilt control by means of insecticidal treatments indicated that rhodiatox, fosfern (containing 20 per cent. para-nitrophenyl diethyl diophosphate), hexason 2540 M, toxaphene, and tartar emetic reduced the incidence of mortality from the disease and gave increases in stand proportionate to the concentrations used (0·25 to 1 per cent. for rhodiatox, 0·125 to 0·5 for fosfern, and 0·25 and 0·5 for the other three). In the case of rhodiatox, hexason, and fosfern the increase in healthy plants resulted in a gain in yield, whereas the damage caused by tartar emetic and toxaphene outweighed the benefit arising from an improvement in the stand.

Henner (J.). **Die Farnblättrigkeit der Tomate.** [Tomato fern leaf.]—*Pflanzenarzt, Wien*, 4, 11, p. 3, 1951.

The symptoms of tomato fern leaf [cucumber mosaic virus], which has become increasingly prevalent of recent years in Austria [*R.A.M.*, 28, p. 377], are briefly described in popular terms.

Linn (M. B.). **Sources of Tomato late blight and suggestions for control.**—*Canner*, 113, 19, p. 12, 1951.

Unsprayed or inadequately treated tomatoes sustained heavy damage from blight [*Phytophthora infestans*] in Illinois in 1951 [*R.A.M.*, 31, pp. 35, 226]. Infection is believed to have first appeared in March or April on greenhouse crops at Fulton, Whiteside county. The rate of spread and dates of occurrence during the summer suggest that the tomatoes over a radius of 50 miles or so south-east and south-west of Fulton may have been infected by spores originating on greenhouse and garden plants in that town. The most likely source of infection for Chicago and its environs was wind-borne spores from southern Wisconsin. In the Kenosha area blight was first detected about the first week in August, infection apparently emanating from piles of discarded potatoes which had become diseased in mid-June. Southern-grown plants are believed to have been the source of infection in Vermilion county.

As regards other States, cull, self-sown, or home-garden potatoes probably provided infective material for Wisconsin, New Jersey, Arkansas, Pennsylvania, and Michigan. Greenhouse tomatoes were another source of infection in Pennsylvania, while southern-grown plants were suspected in Kentucky, New Jersey, and Delaware.

During the winter and spring a watch should be kept for blight on tomatoes in any greenhouses or on home-garden potato plants near potential production areas. The rainfall and recorded minimum temperature indicate when the disease is likely to appear. Temperatures below 70° F., accompanied by showers or dew, are very favourable, though in 1951 blight spread even when night temperatures did not fall below 72°. Southern-grown plants should be examined on arrival for stem and leaf lesions and any suspected material should be sent for diagnosis.

Marcelin (P.). **Essai sur le dépérissement de la Châtaigneraie.** [An investigation on die-back in Chestnut groves.]—*Bull. Soc. languedoc. Géogr.*, Sér. 2, 22, 1, pp. 125–156, 1951. [Abs. in *For. Abstr.*, 13, 3, p. 302, 1952.]

An investigation on die-back of chestnut groves in the Cévennes and other districts of France revealed that although the immediate cause of death was ink disease [*Phytophthora cambivora* and *P. cinnamomi*: *R.A.M.*, 31, p. 39] it was ultimately due to poor, degraded soils, droughts, and heavy exploitation of the trees for tanstuffs.

Orsenigo (M.). **Sulla formazione in cultura di periteci di Endothia parasitica (Murr.) P. J. et H. W. And.** [The formation in culture of perithecia of *Endothia parasitica* (Murr.) P. J. & H. W. And.]—*R. C. Ist. lombardo*, 82 (Ser. III, 13), 1, pp. 236–238, 1950.

This information on the chestnut blight fungus (*Endothia parasitica*) [see next abstracts] has already been noticed from another source [*R.A.M.*, 31, p. 358].

Orsenigo (M.). **Contributo alla conoscenza del genere Endothia. I. Analisi statistica delle dimensioni delle ascospore di alcune specie. II. Identificazione fra E. parasitica (Murr.) P. J. et H. W. And. ed E. fluens (Sow.) S. et S. e loro**

fusione in E. radicalis (Schw.) De Not. Considerazioni sulla patogenicità delle specie e sulla classificazione del genere. [Contribution to the knowledge of the genus *Endothia*. I. A statistical analysis of the ascospore measurements of some species. II. Identification of *E. parasitica* (Murr.) P. J. & H. W. And. and *E. fluens* (Sow.) S. & S. and their fusion in *E. radicalis* (Schw.) De Not. Considerations on the pathogenicity of the species and on the classification of the genus.]—*Phytopath. Z.*, 18, 2, pp. 196–220, 5 graphs, 1951. [English and German summaries.]

Following the examination of a number of isolates from different hosts and localities the author demonstrates in tables of measurements the morphological distinctions between *Endothia gyrosa* [*R.A.M.*, 11, p. 611; 27, p. 114], *E. singularis*, *E. longirostris*, and *E. tropicalis*. *E. fluens* [ibid., 28, p. 427] and *E. parasitica* [see preceding and next abstracts] are practically indistinguishable on this basis, nor can they be separated on ascospore length/width ratio or by a simple comparison of ascospore measurements. Statistical analysis, however, confirmed that they were different from *E. longirostris* and *E. tropicalis*, included in the same section of the genus by Shear, and enabled a distinction to be made between the last two species.

Since there is no major distinction between *E. parasitica* and *E. fluens*, apart from the development of a fan-like mycelium in the host by the former, they are combined and the name *E. radicalis* [ibid., 24, p. 27] is resuscitated to accommodate them. *E. longirostris*, *E. tropicalis* and *E. radicalis* are placed in the subgenus *Euendothia*, and *E. gyrosa* and *E. singularis* in *Proendothia*. Two subspecies of *E. radicalis* are made: *aflabellata* for *E. fluens* and its form *mississippiensis*, and *parasitica* for the canker fungus with its two physiologic races, one on chestnut and the other on oak [ibid., 30, p. 550].

Orsenigo (M.). **Inchiesta sulla diffusione del 'cancro americano' del Castagno (Endothia parasitica (Murr.) P. J. et H. W. And.). (La situazione nelle provincie settentrionali lombarde alla fine dell' estate 1950.)** [Survey of the distribution of 'American canker' of Chestnut (*Endothia parasitica* (Murr.) P. J. & H. W. And.). (The situation in the northern provinces of Lombardy at the end of the summer of 1950.)]—Reprinted from *Ann. Tec. agr.* (*Napoli*), 17, 14 pp., 1 map, 1950. [English summary.]

Chestnut blight (*Endothia parasitica*) is widespread throughout Lombardy, Italy, except for the province of Sondrio, being most severe in Varese and Como and decreasing in intensity in Bergamo and Brescia [*R.A.M.*, 29, p. 129 and preceding and next abstracts]. At the end of the summer of 1950 the disease was present in over 13,500 ha. of chestnut forest in northern Lombardy, compared with 9,870 ha. in 1949. Its distribution by communes in each province is tabulated and illustrated by a map.

Biraghi (A.). **Caratteri di resistenza in 'Castanea sativa' nei confronti di 'Endothia parasitica'.** [Resistance characters in *Castanea sativa* towards *Endothia parasitica*.]—Reprinted from *Boll. Staz. Pat. veg. Roma*, Ser. III, 8, 5 pp., 2 figs., 1950. [Issued 1951.]

In 1939 chestnut trees in coppices at Masone, Genoa, were so badly affected by canker (*Endothia parasitica*) [see preceding and next abstracts] that the disease continued to flourish in spite of stringent eradicatory and sanitary measures. In recent years, however, the damage in this area has not seemed so intense and a more detailed observation of affected ten-year-old trees in one coppice during 1950 confirmed this view. The offshoots from some trunks showed typical symptoms of the disease, including the abundant emission of new shoots below the affected

portion, whereas others appeared less badly affected and very few new shoots were produced. In the early stages of infection the mycelium is unable to penetrate from the bark into the cortex and therefore extends along the offshoot. In later stages the bark becomes blackened and cracked as in *Quercus pubescens* [ibid., 30, p. 550] and the mycelium is confined to small areas or disappears entirely. These manifestations, believed to be due to a resistance factor, have also been observed in other areas of long-standing infection in Liguria and, in the initial phases, in the province of Avellino.

Biraghi (A.). **Fatti nuovi per la lotta contro il cancro della corteccia del Castagno.** [New factors in the control of bark canker of Chestnut.]—Reprinted from *Humus, 1952*, 1, 2 pp., 3 figs., 1952.

This is a popular account of new factors concerning the effect of *Endothia parasitica* on chestnut trees in Italy, the information having already been noticed from other sources [see preceding abstracts].

Lekander (B.), Mathiesen (Aino), & Rennerfelt (E.). **Om Almsjukan samt råd och anvisningar för dess bekämpande.** [On the Elm disease, with advice and indications for its control.]—*Flygbl. Skogsforskningsinst., Stockh.*, 65, 8 pp., 5 figs., [? 1951].

Ceratostomella ulmi was shown by a census taken during the summer of 1951 to be prevalent on elms in Stockholm [*R.A.M.*, 30, p. 85] and its environs, and to be present in other localities of Sweden, including the ports of Kalmar and Norrköping, suggesting its introduction on timber. Further support was lent to this view by the discovery at Gothenburg of a consignment covered with fructifications of the pathogen. The importation of timber (except decorticated) was consequently prohibited by a Royal Decree of 12th January, 1951.

The life-history of the causal organism and the symptomatology and mode of dissemination of the disease are briefly described, and the pamphlet concludes with instructions for its control, involving the extermination of the bark beetle (*Scolytus* spp.) vectors by decortication, scorching, or immersion in water during the summer. The disinfection of implements, e.g., in a 2 per cent. aqueous solution of sodium pentachlorophenol, is also recommended.

Sprau (F.). **Starkes Auftreten der Platanen-Blattnervenkrankheit im Bodenseegebiet.** [A severe attack of the leaf vein disease of *Platanus* in the region of Lake Constance.]—*Pflanzenschutz*, 3, 9, pp. 109–111, 5 figs., 1951.

Attention is drawn to an epidemic of *Gnomonia platani* Klebahn [*R.A.M.*, 30, p. 216; 31, p. 89] on plane (*Platanus*) trees in the region of Lake Constance, Bavaria, in the early summer of 1950. The disease was particularly virulent on the island of Mainau and on the lake banks, *P. occidentalis* [ibid., 30, p. 394], *P. orientalis*, and the widely cultivated *P. acerifolia* being equally susceptible; only *P. orientalis* var. *insularis* showed a measure of resistance. By mid-August the affected trees had made an excellent recovery and put out new growth, but reports from nurseries mentioned permanent injury to young trees as a result of infection of the stem cortex and extensive die-back of the twigs. In such cases it may be worth while to apply copper sprays, but otherwise the only practicable safeguard is the burning of diseased foliage.

Hepting (G. H.), Toole (E. R.), & Boyce (J. S.). **Sex and compatibility in the Oak wilt fungus.**—*Plant Dis. Reptr*, 36, 2, p. 64, 1952. [Multilithed.]

Isolates of *Chalara quercina* [*R.A.M.*, 31, p. 357] from 29 oak trees studied in paired cultures at the United States Department of Agriculture, Asheville, North

Carolina, all proved to be self-sterile hermaphrodites, but interfertile when opposite compatibility types were paired.

Rol (R.). **Le chancre du Chêne Rouge d'Amérique.** [Canker of American Red Oak.] —*Rev. for. franç., 1951*, 11, pp. 704–707, 2 pl., 1951.

For about ten years a canker disease believed to be caused by *Phytophthora cinnamomi* [*R.A.M.*, 31, p. 152] has been localized in certain forests of the Pays Basque, affecting chiefly the American red oak (*Quercus borealis*) and possibly the pedunculate oak [*Q. robur*] and tauzin [*Q. pyrenaica*] as well [loc. cit.]. From a physiological point of view the disease is at present relatively unimportant, but as the cankers affect the base of the trunk it is rendered useless for anything but firewood. In one year little extension of the infected area has been observed, the appearance of the disease probably depending on local environmental conditions. There appears to be no immediate danger of it affecting other species or areas in France, but it is requested that any cases of canker on *Q. borealis* should be reported.

Malençon (G.) & Marion (J.). **Un parasite des subéraies nord-africaines : l'Hypoxylon mediterraneum (D. Ntrs) Ces. et D. Ntrs.** [A parasite of North African Cork plantations: *Hypoxylon mediterraneum* (de Not.) Ces. & de Not.]—*Rev. for. franç., 1951*, 11, pp. 681–686, 3 pl., 1951.

Hypoxylon mediterraneum (*H. sertatum*) [*R.A.M.*, 17, p. 569] has now assumed epidemic proportions on cork oak (*Quercus suber*) in Morocco and also attacks *Q. ilex*, *Q. faginea*, *Eucalyptus camaldulensis*, *E. gomphocephala*, and *E. robusta* [loc. cit.]. Its high pathogenicity to *Q. suber* may be due to the bark being particularly favourable for the fructification of the fungus, as no fruiting was observed on trees deprived of their bark. The conidial state, for which the name *Botrytis sylvatica* Malençon is proposed, was obtained in culture and was observed on trees near Rabat in spring, 1950, following a dry spell.

Laboratory studies in 1946 showed the spores to germinate abundantly (90 to 95 per cent.) at room temperature four months after collection. After six months 11 per cent. germinated at 19° and 25 per cent. at 23° C.

DeBaun (R.) & Nord (F. F.). **The resistance of cork to decay by wood-destroying molds.**—*Arch. Biochem., N.Y.*, 33, 2, pp. 314–319, 1 graph, 1951.

From the Department of Organic Chemistry and Enzymology, Fordham University, New York, the writers describe a new method for the determination of lignin in cork based on the colorimetric estimation of the lignin released by autoclaving with alkali. The application of this procedure in inoculation experiments on bark of cork oak (*Quercus suber*) with the wood-destroying fungi *Trametes cinnabarina*, *Lentinus lepideus* [see below, p. 413], *Polyporus vaporarius* [*Poria vaporaria*], *P. vaillantii*, *Daedalea quercina*, *Merulius tremellosus*, and *Lenzites sepiaria* [*R.A.M.*, 16, p. 4] established a high degree of resistance [ibid., 27, p. 52], presumably attributable either to the protective action of the suberin constituent or to the presence in the cork of anti-fungal substances, the former explanation being regarded as the more plausible.

Bakshi (B. K.) & Bagchee (K.). **Principal diseases and decays of Oaks in India.**—*Indian Phytopathology*, 3, 2, pp. 124–139, 3 pl., 7 figs., 1950.

This list of fungi causing diseases of oak trees in India gives descriptions of the anatomical characters of the sporophores, the cultural characters of the organisms, and the gross characters of the decay produced, and also notes the geographical distribution of the fungi, with special reference to India.

Stereum princeps (syn. *S. scytale*) is widely prevalent in the western Himalaya Mountains up to an altitude of 8,000 ft., and is also present in the Khasi Hills

[Assam] and the eastern Himalayas. It is also found occasionally in the northern plains. A common saprophyte of oak stumps and logs, it is also a wound parasite on various species of *Quercus*, producing a reddish-brown, later white, pocket rot. *Fomes fomentarius* [*R.A.M.*, 14, p. 795; 21, p. 475] is common in the temperate parts of the Himalayas; it generally grows on dead standing oaks, but also infects living trees. It grows on dead wood of walnut, maple (*Acer*), and conifers, and was once found on dying ash. *Polyporus sulphureus* [ibid., 14, p. 795] is prevalent in the Himalayas on living oaks and stumps and is sometimes present on conifer slash. *P. obtusus* [cf. ibid., 27, p. 266], not previously reported from India, is parasitic on *Q. semicarpifolia* and *Q. dilatata*, and can also grow saprophytically; it is present in the western Himalayas (Chakrata division in the Uttar Pradesh and Bashahr division of the Punjab) between 6,000 and 12,000 ft. *P. cuticularis* [cf. ibid., 13, p. 667; 22, p. 2; 25, p. 239] has been found in the eastern Himalayas and is also prevalent in the western Himalayas, in Chakrata, and the Bashahr and Kulu divisions of the Punjab. It may be parasitic as well as saprophytic on various species of oaks, and was once recorded on a living mulberry tree. It also grows on conifer slash. *Polystictus xeranticus*, not recorded outside India, seems to occur in all parts of the temperate region of the Himalayas. It is a common destroyer of oak slash. *Trametes dickinsii* [cf. ibid., 17, p. 785], first recorded in India from the Lokra Hills (Assam) and Bihar, is of frequent occurrence on oak stumps in Chakrata.

Lal (A.) & Tandon (I. N.). **A new species of Gloeosporium on Anthocephalus cadamba.**—*Indian Phytopathology*, 3, 2, pp. 140–147, 13 figs., 1951.

A description is given of a spot disease of the leaves, petioles, stems, and fruits of the cultivated ornamental *Anthocephalus cadamba* growing at Benares, Allahabad, and Dehra Dun, and of the morphology of the causal organism, named *Gloeosporium anthocephali* n.sp., the conidia of which measure 6 to 10 by 3 to 4 μ. In inoculation experiments the fungus was pathogenic to the original host seedlings, but not to tomato, eggplant, or chilli.

Bagchee (K. D.). **Contributions to our knowledge of the morphology, cytology and biology of Indian coniferous rusts. Part II. Observations on the occurrence of Cronartium ribicola Fischer and Peridermium indicum Colley and Taylor on Pinus excelsa Wall. in India with reference to their distribution, pathology, inoculation experiments and comparative morphology.**—*Indian For. Rec.*, N.S., Bot., 4, 1, pp. 1–41, 12 pl. (3 col.), 1 graph, 1950. [Received August, 1951.]

In this further contribution to Indian coniferous rusts [cf. *R.A.M.*, 20, p. 436 and next abstract] the author records the results over a period of eight years of the pathological, morphological, biometrical, and cultural studies of the Indian blue pine rust (*Peridermium indicum*) [loc. cit.], which was observed to be increasing in intensity of attack on *Pinus excelsa* in India. An attempt is made to clarify its systematic position and to establish its affinity with the European and American white pine rust (*Cronartium ribicola*) [ibid., 30, pp. 496, 552; C.M.I. map No. 6]. Inoculations of wild red currant bushes in their natural habitat with five different samples of aecidiospores from *P. excelsa*, four of which were considered to be *P. indicum* and the other (from Kashmir) *C. ribicola*, and reciprocal inoculations with teleutospores from red currant indicated that the two rusts are identical, and it is proposed that the name *C. ribicola* should be retained for the Indian rust, with f. *indica* [? n.f.] added.

Inoculation experiments demonstrated that *P. excelsa* is moderately susceptible to *C. ribicola*. The immunity claimed by American workers [*R.A.M.*, 8, p. 538] may be attributed to mechanical rather than physiological phenomena.

Baggchee (K. D.). **Contributions to our knowledge of the morphology, cytology and biology of Indian coniferous rusts. Part III. The biology of Peridermium brevius (Barc.) Sacc. (Coleosporium barclayense, sp.nov. on Senecio rufinervis DC.), and Melampsora oblonga sp.nov. on the needles of Pinus excelsa Wall.**—*Indian For. Rec.*, N.S., Bot., 4, 2, pp. 43–64, 7 pl. (5 col.), 1950. [Received August, 1951.]

In this further study on Indian coniferous rusts [see preceding abstract] the life history, biology, and taxonomy of the needle rust of *Pinus excelsa* in the Himalayas, previously designated *Peridermium brevius* [*R.A.M.*, 16, p. 146], are fully described. The discovery of the alternate state on *Senecio rufinervis* enables the name *Coleosporium barclayense* n.sp. to be given. The aecidiospores measure 19 to 27 by 14 to 20 μ and have an orange coloured wall 1·5 to 2·5 μ thick, the uredospores are 30 to 35 by 20 to 25 (average 32 by 22) μ, and the teleutospores 72 to 95 by 22 to 35 (90 by 28) μ. *S. alatus* bears a rust which is considered to be either the same as or a physiologic form of *C. barclayense*, while the rusts on *S. chrysanthemoides* and *S. graciliflorus* are identical with *C. senecionis* [ibid., 29, p. 546]. The distribution of these rusts and their hosts in the Himalayas are given.

A new needle rust, an autoecious leptoform occurring only in the teleuto stage on *P. excelsa*, is named *Melampsora oblonga* n.sp. The teleutospores measure 45·44 to 56·8 by 11·36 to 14·2 (average 51·4 by 12·5) μ. The sporidia are 39·79 to 45·44 by 8·52 to 11·36 (42·6 by 11·2) μ.

Carrera (C. J. M.). **La enfermedad de las almácigas de coníferas en la República Argentina.** [The disease of nursery conifers in the Argentine Republic.]—*Bol. Fac. Agron. Vet. B. Aires* 30, 51 pp., 10 figs., 5 graphs, 1951. [English summary.]

This extensive, fully tabulated investigation of the damping-off of nursery conifers (mostly pines) [*R.A.M.*, 31, pp. 307, 361], a major problem in Argentina, where losses from the disease range from 15 to 95 per cent., includes information on its history, symptomatology, and histological features, notes on experimental methods, a systematic study of the morphology, physiology, and pathogenicity of the causal organisms, influence of environmental factors on their development, and a review of the pertinent literature, based on a bibliography of 43 titles.

The isolates comprised *Corticium solani* [ibid., 27, p. 204; 31, p. 153, and next abstract], *Pythium ultimum* [ibid., 27, p. 204; C.M.I. map No. 207], *Fusarium bulbigenum* var. *blasticola* [*R.A.M.*, 27, p. 204], *F. avenaceum* [ibid., 20, p. 235], *F. arthrosporioides* [cf. ibid., 25, p. 13], *F. graminearum* [*Gibberella zeae*: cf. ibid., 29, p. 593], *F. orthoceras* [ibid., 20, p. 235], *F. oxysporum* [loc. cit. and next abstract], *F. solani* var. *martii*, and *F. vasinfectum* [ibid., 26, p. 105]. Of these, *G. zeae* and *F. avenaceum* are new records for pine and *F. arthrosporioides* has not previously been reported from Argentina on pine or any other host. *C. solani* is the most prevalent, followed by *P. ultimum*.

In experiments to determine the susceptibility of pine seedlings of various ages to four of the fungi listed above, *C. solani* caused 100 per cent. infection in 5- to 15-day-old seedlings, 83·3 in 21-, 70 in 28-, and 43·3 in 34-day-old; *F. avenaceum* 53·3 in 7, falling to 6·7 in 34-day-old; *F. bulbigenum* var. *blasticola* 7·7 in 11- and 3·3 in 21-day old; and *P. ultimum* 76·7 in 7- and 10 in 34-day-old. None of the species was pathogenic to 69-day-old plants. The most vulnerable portion of the seedling appeared to be at about 1 cm. above soil-level, at which point *C. solani*, *P. ultimum*, and *F. avenaceum* caused 100, 70, and 26·7 per cent. infection, respectively, the corresponding figures for the collar being 100, 50, and 3·3, and for the cotyledons 93·3, 36·7, and 6·7.

No evidence was obtained of toxin production by these three species. The most

suitable of the liquid media tested for the culture of *C. solani* and *F. avenaceum* was Richards's, while 2 per cent. potato dextrose broth was preferable for *P. ultimum*. *C. solani* and *P. ultimum* also throve on 1 or 2 per cent. oatmeal, maize meal, malt, and potato dextrose agar, but *F. avenaceum* did not grow so well on these substrata. Of five acids tested as growth-inhibitors, salicylic was the most potent, acting on *C. solani* at 0·5 per mille, on *P. ultimum* at 0·01, and on *F. avenaceum* at 0·7. A number of organic and inorganic compounds were also fungistatic, e.g., beta-naphthol [ibid., 25, p. 177], hydroxymercurinitrophenol, 8-hydroxyquinoline [ibid., 28, p. 74], sodium mercuricyanolate, and mercuric chloride (all at 0·01 per mille). The optimum hydrogen ion concentrations for the development of the three foregoing species were pH 6 to 6·2, 6 to 6·2, and 6·2 to 6·4, respectively, and their minimum, optimum, and maximum growth temperatures were 10°, 24°, and 33° C., 4°, 21° to 30°, and 33°, and 4°, 24°, and 30°, respectively.

Cockerill (J.) & Cafley (J. D.). **Damping-off of Red Pine seedlings at Orono, Ont.**—*Bi-m. Progr. Rep. Div. For. Biol., Dep. Agric. Can.*, 7, 5, pp. 1–2, 1951.

In October, 1950, plot experiments were made to determine the effect of fertilizers and mulches on seedling mortality of red pine [*P. resinosa*] in Ontario caused by damping-off fungi [*R.A.M.*, 30, p. 638 and preceding abstract], of which *Fusarium scirpi* var. *acuminatum* was isolated from diseased seedlings most frequently, and a mixture of *F. solani* and *F. oxysporum* [loc. cit.] late in the season, followed by *Rhizoctonia* [*Corticium*] *solani* [loc. cit.]. *Alternaria* sp. and *Nigrospora sphaerica* were also obtained.

Statistical analyses of the results showed that fertilizers produced no significant differences in germination or mortality, although *N. sphaerica* was not obtained from beds having nitrogen fertilizer, nor *F. solani* and *F. oxysporum* from those with potassium alone or plus phosphorus. Beds with a density of about 90 seedlings per sq. ft., however, were free from damping-off, and of any seedlings in excess of this density it was calculated that a little over a half would succumb. Peat applied on the surface significantly reduced both germination and mortality. It is inferred that the use of peat may offer an insurance of seedling survival under conditions that may be expected to produce attacks by damping-off fungi.

Jørgensen (E.) & Petersen (B. B.). **Angreb af Fomes annosus (Fr.) Cke, og Hylesinus piniperda L. på Pinus silvestris i Djurslands plantager.** [Attack of *Fomes annosus* (Fr.) Cke and *Hylesinus piniperda* L. on *Pinus sylvestris* in the Djursland plantations.]—*Dansk Skovforen. Tidsskr., 1951*, 9, pp. 453–479, 4 figs., 1 graph, 1 map, 1951. [English summary.]

Since 1944 a large part (perhaps over 80 per cent.) of the 20- to 30-year-old Scots pine (*Pinus sylvestris*) stands covering some 1,000 ha. of heath and poor, formerly arable soil in eastern Jutland, Denmark, has been affected by a rapidly progressive die-back due in the first instance to *Fomes annosus* [cf. *R.A.M.*, 29, p. 391; 31, p. 262], which paved the way for subsequent infestation by the bark beetle *Hylesinus piniperda*. Standing trees attacked by *F. annosus*, which was found exclusively in thinned stands, may appear healthy even if a third of the root system is involved. No definite sequence of root infection could be determined, but a dead tap-root was invariably accompanied by several necrotic lateral roots. Conidiophores of the fungus were detected between the bark scales on two of the excavated roots.

The control of *F. annosus* in plantations where it has already become established is regarded as impracticable, and therefore the depredations of the bark beetles can only be restricted by the removal of all dead and dying trees and destruction of the bark on the stumps before 1st April to forestall breeding.

Davidson (A. G.). **Decay of Balsam Fir in New Brunswick.**—*Bi-m. Progr. Rep. Div. For. Biol., Dep. Agric. Can.*, 7, 5, p. 1, 1951.

The incidence and amount of decay of balsam fir [*Abies balsamea*: see next abstract] in New Brunswick, caused chiefly by *Stereum sanguinolentum* and *Corticium galactinum* [*R.A.M.*, 31, p. 50], was found to increase with age and diameter of the trees. None under 40 years of age examined was decayed but half of those at 90 years and all at 160 were affected. The cull volume at 80 and 170 years was equal to one-fourth and three-fourths of the gross merchantable volume, respectively. Approximately 50 per cent. of the trees in the 6-in. diameter class were decayed and all over 15 in. The cull percentages in the 4-in. and 17-in. diameter classes were 11·1 and 51·3, respectively.

Basham (J. T.). **The pathological deterioration of Balsam Fir killed by the Spruce budworm.**—*Pulp Pap. (Mag.) Can.*, 52, 9, pp. 120–122, 125–126, 128, 130, 133–134, 23 figs., 2 graphs, 1951.

A study has been in progress since 1946 at the Forest Insect Laboratory, Sault Ste. Marie, Ontario, on the pathological aspects of the fungal deterioration of balsam fir (*Abies balsamea*) [see preceding abstract] killed in the recent outbreak of spruce budworm (*Choristoneura* [*Harmologa*] *fumiferana*) [*R.A.M.*, 31, p. 51] in the north-west of the province. *Polyporus* [*Polystictus*] *abietinus* [ibid., 29, pp. 68, 393; 30, p. 206] was responsible for 92·4 per cent. (on a volume basis) of the advanced deterioration present in 182 of the trees selected in 1949 and 1950 for detailed examination. It was preceded by *Stereum chailletii* (*J. For.*, 38, p. 276, 1940), which apparently developed shortly after the death of the trees and spread through the outer wood, causing a yellowish stain, until it was replaced by the pitted sap rot characteristic of *P. abietinus*. The remaining 7·6 per cent. of the damage was caused by *Fomes pinicola* [*R.A.M.*, 31, p. 215] and *Coniophora puteana*, the former predominating. In trees dead for less than one year at the time of examination the incidence of advanced decay was negligible, amounting to 0·6 cu. ft. or 0 per cent. (by weight) of the total gross merchantable volume; for a period of one to two years after death the corresponding figures were 78·7 and 25, respectively; two to three years, 117·3 and 36·2; three to four years, 39·1 and 40·3; and four to five years, 18·6 and 41·9. The percentages of total merchantable volume recoverable for these five periods were 87·9, 65·9, 47·4, 38·4, and 36·6, respectively. Summer-killed trees showed a higher rate of deterioration (17·5, 38·2, and 53·5 per cent. of the total merchantable volume after one or two, two to three, and three to four years, respectively) than winter-killed ones (29·9, 34·1, and 39·1, respectively).

The effects of fungal deterioration on the utilization of the wood for pulp are discussed. Material in which the decay is not too far advanced may safely be used in the sulphite, but not in the groundwood process. Salvaged within a year of death, it will produce pulp with insignificant reductions in yield and quality, but after three years there is little or no prospect of a profitable salvage operation.

De Stevens (G.), De Baun (R. M.), & Nord (F. F.). **On the mechanism of enzyme action. XLV. The role of certain dicarboxylic acids in the formation of oxalic acid by wood-destroying molds.**—*Arch. Biochem., N.Y.*, 33, 2, pp. 304–313, 1951.

In further studies at Fordham University, New York [cf. *R.A.M.*, 30, p. 88], on the mechanism of oxalic acid formation by wood-destroying fungi [ibid., 30, p. 254], alkalinity of the medium was shown to be the principal factor involved in the accumulation of oxalate by *Trametes cinnabarina* [ibid., 18, p. 335, and above, p. 409]. Glutamate and aspartate gave rise to oxalate formation by this species and *Lentinus lepideus* [loc. cit. and next abstract].

Apenitis (A.), Erdtman (H.), & Leopold (B.). **Studies of lignin. Part V. The decay of Spruce wood by brown-rotting fungi.**—*Svensk kem. Tid.*, 63, 9, pp. 195–207, 8 graphs, 1951.

This fully tabulated analytical study at the Royal Technical College, Stockholm, of the products resulting from the attack on spruce wood of pure cultures of four brown-rotting fungi, namely, *Coniophora puteana*, *Lentinus lepideus*, *Lenzites sepiaria*, and *Merulius lacrymans*, demonstrated that the cellulose is almost completely and uniformly destroyed, while the pentosans seem to contain relatively resistant fractions. The fungi also decompose the lignin [see preceding abstract] and change the residual lignin in various respects. The loss of weight and other transformations effected by *C. puteana* appear to be less extensive than those due to *M. lacrymans* and in particular to *L. sepiaria* and *Lentinus lepideus*.

Scala (A.). **La conservazione del legno in rapporto al suo impiego nei vari rami della costruzione e dell' artigianato.** [Wood preservation in relation to its use in various branches of construction and industry.]—*Chimica*, 6, 7, pp. 246–250, 1951.

Nearly all the timber required by Italy for constructional and industrial purposes has to be imported, and its preservation, simultaneously with forest rehabilitation and extension, is a matter of urgent importance. In this connexion the author presents an up-to-date survey of the principles and practice of impregnation by standard methods, with full directions for their application to different kinds of wood and for various industrial purposes.

Hickson (H. E.). **Wood-preservatives evaluation. The need for service records.**—*Chem. Tr. J.*, 129, 3353, pp. 542–543, 1951.

Present methods of laboratory testing of wood preservatives do not always agree with bulk practice, and can, in general, only serve as indications of their probable performance in different situations. To overcome this difficulty the author proposes the compilation and regular publication of service records by a committee of consumers, which should receive the financial support of the trade, as represented by the British Wood Preservers' Association. Some practical suggestions for the implementation of this recommendation are made.

Cox (H. A.). **The preservation of wood. I. The case for preservative treatment. II. The main types of preservatives. III. Methods of applying preservatives. IV. Pressure treatments.**—*Wood, Lond.*, 16, 8, pp. 298–300; 9, pp. 345–346; 10, pp. 382–384; 11, pp. 420–422, 10 figs., 1951.

Much useful information is presented on the aspects of timber preservation against lignicolous fungi, insect pests, and fire indicated in the title of this paper.

Nattrass (R. M.). **The 'canker' or 'black leg' disease of Cabbages and Cauliflowers.**—*E. Afr. agric. J.*, 16, 4, pp. 178–180, 4 figs., 1951.

Phoma lingam first caused damage to cabbages in Kenya in 1944 [*R.A.M.*, 26, p. 233] and the author considers there is little doubt the fungus was introduced into the country in seed. He describes the symptoms of the disease and its control by seed treatment with mercurial dusts and by hot water [cf. ibid., 27, p. 343]. If, in spite of these precautions, affected seedlings develop, they should be removed and the remainder sprayed three or four times with a copper fungicide, such as Bordeaux mixture 4–4–50 [cf. ibid., 19, p. 70; 31, p. 158], to which a spreader has been added, or with a proprietary copper fungicide. Dipping the seedlings in the same fungicide would be worth trying.

Hull (R.). **Spoilage of Sugar Beet.**—*Brit. Sug. Beet Rev.*, 20, 1, pp. 25–29, 5 figs., 1951.

Information is presented in semi-popular form on the agents responsible for the spoilage of stored sugar beet in Great Britain [*R.A.M.*, 29, p. 240], among which may be mentioned green mould (*Penicillium* sp.), violet root rot [*Helicobasidium purpureum*], more than 10 per cent. infection by which involves a risk of heating and decomposition throughout the heap, crown rot (*Phoma betae*), *Fusarium culmorum* (associated with boron deficiency), and clamp rot (*Botrytis cinerea*). In inoculation experiments with *B. cinerea* twice as much rot developed at 25° C. as at 13°. At 7·5° it took 35 days for the same amount of decay to develop as in 14 at 13°, while at 3° the incidence recorded after 35 days was negligible. White rot (*Rosellinia necatrix*), though less common than the five foregoing, may occasionally be responsible for substantial losses.

Wenzl (H.). **Die Vergilbungskrankheit, eine neue Gefahr für den Rübenbau.** [The yellows disease, a new threat to Beet cultivation.]—*Pflanzenarzt, Wien*, 4, 11, pp. 5–6, 1 fig., 1951.

The recent steady extension of beet yellows virus in south and south-east Germany [*R.A.M.*, 29, p. 549] has been followed by its appearance in Austria. The symptoms of the disease and its mode of transmission are described and possibilities of control discussed.

Ernould (L.). **Les ennemis et maladies de la Betterave en Belgique en 1951.** [Pests and diseases of Beet in Belgium in 1951.]—*Publ. Inst. belge Amélior. Better.*, 19, 6, pp. 273–291, 1951. [Flemish and English summaries.]

Virus yellows was resonsible for substantial damage to the Belgian beet crop [*R.A.M.*, 31, p. 159] in 1951, when precipitation was abnormally heavy, especially during the spring and summer. By the end of August or early September 95 per cent. of the crop was infected in the light and medium-light soils of Hainault and Brabant, as well as over a large area of Hesbaye and Condroz. Leaf spot (*Cercospora beticola*) [ibid., 31, p. 364] was prevalent and severe from mid-August until October.

Starr (G. H.), Burke (D.), Smith (W.), Hildreth (R.), & Paulus (A.). **Antibiotics for Bean blight control.**—*Agron. J.*, 43, 12, p. 617, 1951.

In experiments at the Wyoming Agricultural Experiment Station, although streptomycin (1 in 100) has given promising results [*R.A.M.*, 30, p. 597] against bean [*Phaseolus vulgaris*] blight [*Pseudomonas medicaginis* f.sp. *phaseolicola*] in the greenhouse, in outdoor plots blight ultimately developed unless the period of treatment was prolonged from 15 minutes to half-an-hour or an hour, which led to slipping of the testas and reduction of germination. These inconveniences were overcome, however, by prior immersion of the seed in liquid latex (1 in 7) for 30 minutes. Field tests are in progress at three substations in the State with treating periods up to one hour to determine the duration necessary for adequate control. Purified antibiotics would be too costly for application on large quantities of seed, but if the method continues to prove successful, crude material might be used on small lots in seed plots to provide an increase for planting larger fields in the following year.

Menzies (J. D.). **Observations on the introduction and spread of Bean diseases into newly irrigated areas of the Columbia Basin.**—*Plant Dis. Reptr*, 36, 2, pp. 44–47, 1952. [Multilithed.]

The author discusses the importance and probable sources of the following major bean [*Phaseolus* spp.] diseases, which have become established during the last five years in the newly irrigated lands of the Columbia Basin area, Central Washington, where beans were not previously grown commercially: root rots caused by *Fusarium*

spp. [*R.A.M.*, 30, p. 597; 31, p. 44] and *Rhizoctonia* [*Corticium*] *solani* [ibid., 29, pp. 499, 599], rots due to *Botrytis* sp. [ibid., 30, p. 140] and *Sclerotinia sclerotiorum* [ibid., 30, p. 502], common bacterial blight (*Xanthomonas phaseoli*) [ibid., 31, p. 219] and halo blight (*Pseudomonas* [*medicaginis* f.sp.] *phaseolicola*) [loc. cit. and C.M.I. map No. 85], wilts caused by *Pythium butleri* [*P. aphanidermatum*: *R.A.M.*, 31, p. 366] and *Corynebacterium flaccumfaciens* [ibid., 31, p. 3], rust (*Uromyces phaseoli*) [*U. appendiculatus*: ibid., 30, p. 575], and the viroses curly top [ibid., 29, p. 600], a strain of bean mosaic [ibid., 31, p. 218; C.M.I. map No. 213], and bean yellow mosaic [*R.A.M.*, 30, p. 91].

While sprinkler irrigation favours the development of bacterial diseases, they are usually absent in furrow-irrigated fields; the latter system is, therefore, recommended for seed production. Attention is also drawn to the importance of using disease-free seed and starting a rotation system before the land is generally contaminated.

Weiss (M. G.). **More and better Soybeans through research.**—*Soybean Dig.*, 11, 11, pp. 24–25, 1 map, 1951.

During 1950 the area occupied by soy-beans (15,000,000 acres) and the production of 287,000,000 bush. exceeded all previous records in the United States. At the same time two diseases, hitherto of little significance, became prevalent throughout the south. They were target spot (*Helminthosporium vignicola*) [*R.A.M.*, 28, p. 559] and frog-eye leaf spot (*Cercospora sojina*) [ibid., 30, p. 210], which was believed to be confined to southern Indiana and Illinois. *Phyllosticta* leaf spot [cf. ibid., 11, p. 88; 24, p. 5; 27, p. 7] also appeared early in the season, but its advance was arrested by the drought prevailing during the summer in all southern areas.

Genetic resistance to many soy-bean diseases is now available to breeders, though for the most part it has not yet been incorporated into agronomically acceptable varieties. Much more work is needed, however, on other potentially serious diseases, resistance to some of which has not yet been found within the soy-bean genus.

Wilkinson (R. E.). **Parsnip canker is caused by Itersonilia sp.**—Abs. in *Phytopathology*, 42, 1, p. 23, 1952.

Although parsnip canker has attracted more attention in England [*R.A.M.*, 30, p. 94] than in the United States, growers in New York and neighbouring States regard it as the main problem in the production of the crop. The ordinarily dry, chocolate-brown rot developing near the shoulder or crown of the root late in the season and in storage was shown to be caused by a species of *Itersonilia*, the isolation of which is more easily effected by spore discharge from infected tissue suspended above agar than by the usual method of tissue plantings. The fungus also causes a leaf spot, which apparently serves as a source of infection for the root rot or canker phase of the disease. Typical symptoms of both stages were induced by root and leaf inoculation with pure cultures, and the pathogen was reisolated from the infected tissues. In the cool, damp season of 1950 the leaf spot was so severe in the lower parts of many fields that the plants were defoliated by mid-September. Wild parsnips were also affected.

Singh (B.) & Gupta (V. C.). **An anthracnose disease of Spinach.**—*Curr. Sci.*, 20, 9, pp. 239–240, 1951.

The symptomatology of spinach anthracnose and the morphology of the causal organism, *Colletotrichum spinaciae* [*R.A.M.*, 19, p. 189], are described in connexion with its discovery, for the first time in India, at and near Kanpur, Uttar Pradesh, in 1947. Inoculation of spinach resulted in the development of typical symptoms in the course of six to ten days and reisolations gave rise to cultures identical with the original ones.